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Ambient Assisted Living user interfaces

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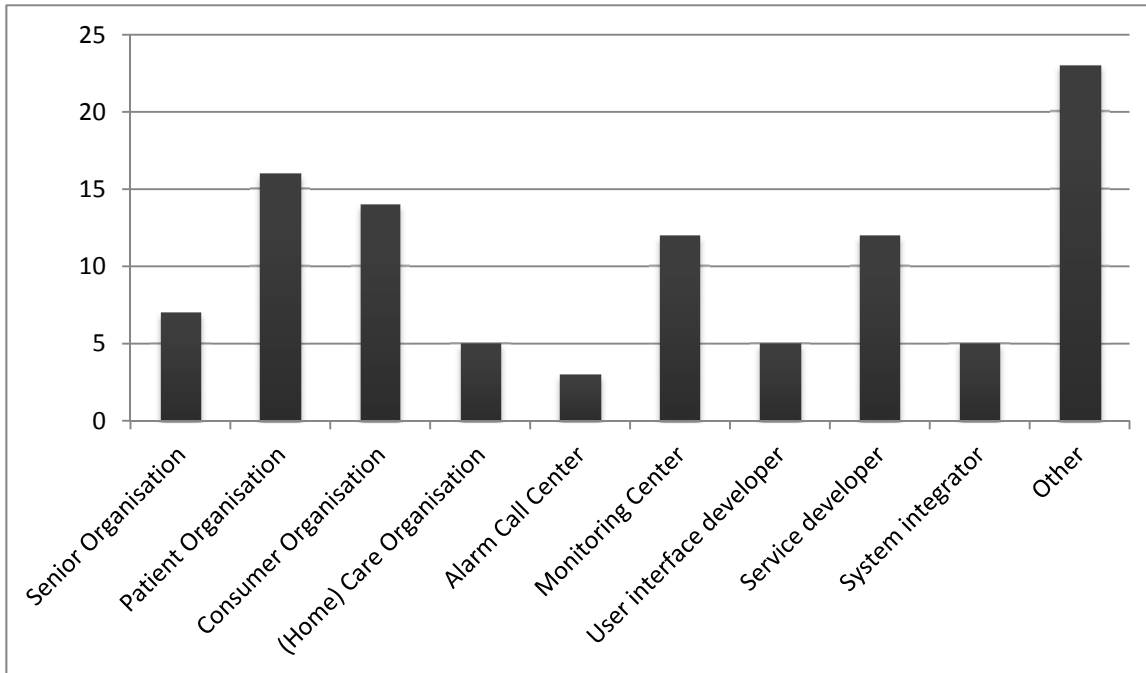


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Abbreviations

<i>Abbrev.</i>	<i>Description</i>
AAL	Ambient Assisted Living
AAL JP	Ambient Assisted Living Joint Programme
AALuis	Acronym of this Project – Ambient Assisted Living user Interfaces
AAMI	Age-associated memory impairment
COPD	Chronic obstructive pulmonary disease
ELGA	Elektronische Gesundheitsakte (Austrian Electronic Health Record)
EUP	End user perspective
ICT	Information and communication technologies
SP_CG	Service Provider/Caregiver
SP_DEV	Service Provider/Developer
SP_MC	Service Provider/Monitoring Centre
UI_DEV	User Interface Developer
UG	User group

Executive Summary

This deliverable presents the results of the requirements analysis of the AALuis project. The aim was to directly involve potential end users as well as relevant stakeholders in order to develop solutions in AALuis that match the needs of the target groups. Therefore, we describe at first the AALuis target groups in terms of end users and stakeholders. Two end user groups have been defined in order to demonstrate the concept and the abilities of AALuis: on the one hand so called younger elderlies oriented rather to lifestyle services and on the other hand older elderlies rather requiring care services. As AALuis intends to develop a middleware as a basis for end user solutions the consideration of needs and wishes of stakeholders are important for the success of the project. The main stakeholders are developers of services and user interfaces as well as caregivers and monitoring centres.

We present methods and results of the requirements analysis of end users and stakeholders in chapter 3 and 4. For analysing end users' needs we conducted a Cultural Probing study followed by context interviews in the homes of the participants. Besides, the created end user scenarios (see D1.2) have been discussed in focus groups. Stakeholder needs have been gathered with the help of an online survey that also included relevant scenarios. Both corresponding chapters contain a final section where the important implications for the specification phase of AALuis are elicited. For targeting end users important implications include to involve trustworthy persons of the elderlies, to leverage existing technologies like the TV and to explain functionalities as well as privacy issues. For developers visual developments tools and migrating tutorials should be made available while caregivers and monitoring centres need easy and detailed configuration options as well as a clear idea of use cases and business opportunities. Accordant technical and trial requirements that result of the implications are described in the following chapters (5 and 5.3) and are the basis for the AALuis specification.

In the updated version of this deliverable we did not remove any information we gathered for the first version. Instead, we updated the technical requirements (chapter 5) based on the insights that we derived from the formative usability testing and the lab trials. Accordingly, we also described how we treated the trial requirements defined in the first version.

1 About this Document

1.1 Role of the deliverable

This deliverable contains the definition of the AALuis target groups and thus influences all other deliverables of the project at least indirectly. The results of the requirements analysis that takes needs and wishes of end users and stakeholders into account are the basis for the specification phase of AALuis. This means that this deliverable has a strong influence especially on the work that will be published in D2.2, D3.2 and D4.2.

End user requirements as well as stakeholder requirements include results of discussions about the created scenarios which are published in D1.2. This deliverable and D1.2 have been written in parallel as the requirements analysis influenced the AALuis scenario creation and the feedback at the scenarios influenced the implications of the requirements.

1.2 Relationship to other AALuis deliverables

The deliverable is related to the following AALuis deliverables:

<i>Deliverable:</i>	<i>Relation</i>
D1.2	The scenarios published in D1.2 were discussed with users in the requirements analysis and iterated according to the results. This is why the two deliverables are bound together.
D2.2	The results of the requirements analysis are the base for the upcoming specification phase and thus have a direct influence on the description of the middleware architecture.
D3.2	The results of the requirements analysis are the base for the upcoming specification phase and thus have a direct influence on the description of the user interface specification.
D4.2	The results of the requirements analysis are the base for the upcoming specification phase and thus have a direct influence on the description of the service specification.
D6.2	Based on the formative usability testing and the lab trials reported in D6.2, this deliverable has been updated.

2 AALuis target groups

2.1 End Users

Like written in the DOW, the project results of AALuis shall bring benefits to all elderly users by developing a flexible solution based on a middleware wherewith various services can be connected and offered with arbitrary user interfaces.

Since the group of elderly people is very heterogeneous, we defined two concrete target groups for being able to evolve concrete needs, to design accordant user interfaces and to evaluate them with real end-users. In order to demonstrate the flexibility of AALuis we decided to include two rather distinctive end user groups: users that can benefit either from services providing comfort and certain assistance (User Group 1) or more advanced assistance related to care services due to age related illnesses and disabilities (User Group 2). Additionally, the user groups are distinct within social aspects and ICT knowledge.

For a more detailed description we distinguish these two user groups on the basis of five different categories: social, physiological, cognitive, ICT-knowledge and testing environment. This distinction is necessary for a purposive recruitment of test users for the user involving tasks of the project. The detailed description is based on existing and successful AAL services provided by service providers or user organisations to end users. For this reason user group 1 shall rather be attracted by lifestyle services while user group 2 shall rather be focused on care services. For a detailed description of the target groups see Table 1.

2.1 Stakeholders

The AALuis middleware will offer interfaces for user interfaces and services. As older people usually do not cope with programming a middleware AALuis needs to attract stakeholders that leverage AALuis to bring their services and user interfaces to the end users. For this reason AALuis needs to be attractive for service providers that offer helpful services to support older people remain living independently at home. AALuis also needs to be attractive for user interface and service developers that design user interfaces and services for people with special needs. The main benefit of AALuis for these two stakeholder groups is being able to increase the coverage of their products. On the one hand services will be available for a high range of devices without the need of service providers to develop an accordant user interface on their own and on the other hand specialized user interfaces become more interesting as a bunch of services can be accessed with the help of AALuis.

In order that these advantages have an effect it is important to take particular requirements of stakeholders into account. Like described the essential stakeholders of AALuis are service providers and user interface developers. In section 4 Stakeholder Requirements we present how we analysed their requirements.

	<i>User Group 1 (more oriented to lifestyle services)</i>	<i>User Group 2 (more oriented to care services)</i>
<i>Social</i>	Retired people, living independently at home (alone or with partner) Frequent contact to relatives and friends	Retired people, living independently at home (alone or with partner) needing care services to be able to live in their own flat. Few social contact to relatives and friends
<i>ICT Knowledge</i>	Experienced using mobile phones Basic internet knowledge	Hardly any experience with ICT except basic mobile phone and TV usage
<i>Physiological</i>	60 – 70 years old (after retirement) normal sight (visual acuity > 0.2) at least with vision aids No age-related physiologic limitations No chronic diseases	75 – 85 years old normal sight (visual acuity > 0.2) at least with vision aids Less abilities in motor skills (e.g. danger of falling) In need of some type of medication
<i>Cognitive</i>	No cognitive impairment other than self-reported slight AAMI (Age Associated Memory Impairment) ¹	Slight dementia → multiple cognitive deficits that include memory impairment MCI (Mild cognitive impairment) ² , but no dementia in an advanced state (e.g. Dementia of the Alzheimer Type, Vascular Dementia, Dementia to Medical Condition, Parkinson Disease, HIV, Substance Induced Dementia)
<i>Major technical environment to be tested</i>	Mobile devices and Smart home components Internet connection	Smart Home components Internet connection

Table 1: Categorisation of AALuis target groups

¹ AAMI (Age Associated Memory Impairment) is defined as a specific impairment in memory, not affecting other cognitive areas and that does not have effects on the Activities of Daily Living (self-care, hygiene, dressing, etc.). Nevertheless AAMI affects the normal functioning because it interferes on the remembering of daily information.

² Mild cognitive impairment can be distinguished from Alzheimer and normal aging for clinical trials [4].

3 End User Requirements

In order to gather information about special needs and wishes of the two AALuis end user groups we applied the method of Cultural Probing and interviewed the participants afterwards in their homes. Furthermore, we discussed the end user scenarios (see D1.2) with the two end user groups in focus groups. Based on the results of these activities specific requirements for each group were deduced.

3.1 Cultural Probing

Cultural Probing [1] is employed to gather information about people and their activities. In contrast to direct observation, the technique allows participants to self-report.

3.1.1 Short Introduction to Cultural Probing

The method has been first described by Gaver and colleagues [1] and is usually used in the early design process to gather needs and daily routines of potential users. Cultural Probes are appropriate to gather information from users with minimal influence on their behaviour and their actions. It is used over a certain period of time to gather the daily routines. Usually selected participants are briefed, given a kit of materials, and briefed about the requirement to record specific events, feelings or interactions over a specified period. Typically, follow up interviews are conducted at some point within the actual probing phase and afterwards. This helps to ensure that participants are actively engaged, and are collecting the required information. When participants return their probing material another interview is conducted to see what their general feelings and opinions towards the topic of interest are. Typically a debriefing session e.g. in the form of a focus group with all participants – after the material has been analysed – is conducted in order to supplement, validate and explore the information gathered by the participants.

3.1.2 Research Questions within AALuis

By utilizing the method of Cultural Probing we wanted to investigate problems and barriers older people have in their daily life and where AAL services could apply. Additionally, we wanted to examine the daily routines of the participants to better understand which new AAL services could be helpful. For this reason the following research questions which can be assigned to six different domains should be answered:

Used services

Q1: Which services are used in general and which motivation leads to it?

Q1.1: Which services do older people use in their daily life?

Q1.2: Why do older people use certain services (motivation)?

Problems and Barriers in daily routines

Q2: Which barriers or problems occur during daily routines?

Q2.1: Which barriers occur in general?

Q2.2: Which barriers occur within the usage of AAL services (lifestyle and medical services)?

Support for older people by other persons

Q3: Who supports the older people dealing with problems or barriers?

Influence of other persons

Q4: Which influence do other persons have on the usage of AAL services and general activities?

Q4.1: Which persons accompany certain activities (AAL services)?

Q4.2: Which person is the one to motivate older people to do certain activities?

Reminders

Q5: At which particular places in the home of older people, do they usually remind themselves of medication?

Technology usage and acceptance

Q6: Which technologies are currently used by the older people and which will be accepted in the nearer future?

Q6.1: Which technologies are used by older people?

Q6.2: Which attitude towards technology do older people have?

Q6.3: Which attitude towards technical supported AAL services do older people have with regard to their future?

3.1.3 Procedure for AALuis

The participants received a “Cultural Probe”-package for recording their daily routines and the experiences they made related to any potential AAL services. The focus was on problems that occur within their daily routines, especially on problems they experience when utilising some kind of services (lifestyle and care services). The structure for the Cultural Probing procedure was the following:

- 1) Briefing of participants
- 2) Pre-Questionnaire (in Briefing session)
- 3) Relationship map (in Briefing session)
- 4) Cultural Probing phase for two weeks
- 5) Individual Post-interview in the homes of the participants

The presented research questions of the previous section and these activities which will be introduced subsequent are mapped afterwards in Table 2.

3.1.3.1 Briefing of participants

The participants received a detailed briefing in form of a workshop – one workshop was held with participants of user group 1 and one with participants of user group 2. A briefing document for explaining the whole procedure was provided in German language, since all participants live in Austria. The following aspects have been tackled in the briefing session: aim of AALuis in general and of the current study, informed consent, disposition and explanation of the probing material, creation of the relationship map, answer of the pre-questionnaire and payment of the first part of the financial compensation. The participants received 80€ as compensation for the whole probing study. After the briefing session they got 20€ and the rest was paid after the post-interviews.

3.1.3.2 Pre-Questionnaire

A part of the briefing session was the answer of two short questionnaires. The first one was about the usage of AAL services and the second one about usage of various technical devices (see Appendix C). If the participants stuck the briefing moderator were allowed helping them to answer the questions properly. With the answers of these questionnaires it should be easier to understand some results of the probing phase.

3.1.3.3 Relationship map

The relationship map should give an overview on the social interactions of the participants. The participants were asked to indicate with whom they interact and how intensively. In addition, they were asked to indicate how they usually interact with them and for what reason. Finally, they are asked to stick a sticker to the person who motivates them most for any activities and they shall write down why. By this means, we got a better impression of the social activities of the both user groups.

3.1.3.4 Cultural Probing phase

After the briefing session the two-week probing phase started. Therefore the participants took the probing package home and reported their activities with the accordant material. The probing material included a diary, a disposable camera, post-its, post cards and some pens (see Figure 1). In the following the purpose of the material is explained:



Figure 1: Probing material

1) Diary

In the diary people should report on their activities on a daily base. Therefore a day was divided into 5 parts according to typical daily routines for elderly people in general and represented by special fields in the diary:

- Morning
- Forenoon
- Time around lunch
- Afternoon

- Evening

The diary was designed in the format DIN A4 wherewith a double page represented one day. Each part of the day brings its own experiences and problems. This is why participants were asked to fill out questions for each of the parts of the day as well as for the day as a whole. In order to have the relevant questions always in mind of the participants the diary contained a fold-out page with these questions:

Following questions were posed for *each part of the day*:

- What have you done in this part of the day?
- Which lifestyle services did you use?
- Which medical services did you use?
- Why did you use these services?
- Which problems or barriers occurred in this part of the day?

Following questions were asked for *conclusion of the day*:

- Is there something you would rather have done instead or additionally?
- What was disturbing to you today? Did you or a surrounding person have any problems or did any barriers occur to you or them?
- Did anyone help you or the other person with the problems?
- What other kind of medical or lifestyle services would you like to use at this part of the day in addition?

Additionally, the participants should select a smiley for each part of a day expressing their general mood at this certain part of the day. At the end of the diary further space is provided to write down rough descriptions of the taken photos.

2) Disposable camera

The disposable camera was used to take pictures of services they used at home during the two weeks of data collection (medical and lifestyle services). At the end of the two weeks the placed post-its should be captured with the camera as well. Overall they had the chance to take 36 pictures.

3) Post-its

To get an impression where participants remember themselves to take their medication (blue), or measure certain physical parameters (pink) we provided two different coloured post-its. The participants were asked to stick a post-it to that very place the need of upcoming medication came to their mind.

4) Postcards

Three postcards with the phrase “Dear Santa, I wish...” written on them were also provided with the probing material. As the probing phase took place in the weeks before Christmas the postcards gave the participants a possibility to express a special wish. The accordant task was, whenever a participant felt as if something is hindering him/her from doing something they really wanted to do they might write it down as a wish.

3.1.3.5 Individual Post-interview in the homes of the participants

After the 2 weeks of data collection, the material was picked up at the participants' homes and a one-hour qualitative interview was conducted. In the post-interviews an interviewer

asked about their feelings concerning the probing phase and discussed the collected material. Additionally, the participants were asked to give a short tour around his/her flat/house to get some more impressions on the living circumstances, the activities and the accompanying problems or barriers. Additionally, a technology tour in the respective household to get to know used technical devices was conducted. The remaining 60€ compensation were paid after the interview.

<i>Research Question</i>	<i>Probing Material</i>							
	<i>Questionnaire</i>	<i>Diary</i>	<i>Camera</i>	<i>Post-its</i>	<i>(Post) cards</i>	<i>Relationship Map</i>	<i>Post-Interview</i>	<i>Technology Tour</i>
Q1: Which services are used in general and which motivation leads to it?	x	x	x			x	x	x
Q1.1: Which services do elderly use in their daily life?	x	x	x					x
Q1.2: Why do elderly use certain services (motivation)?		x				x	x	x
Q2: Which barriers or problems occur during daily routines?		x					x	x
Q2.1: Which barriers occur due to constraints of physical condition?		x			x		x	
Q2.2: Which barriers occur within the usage of AAL services (lifestyle and medical services)?		x			x		x	x
Q3: Who supports the elderly with dealing with problems or barriers?		x				x	x	
Q4: Which influence do other persons have on the usage of AAL services and general activities?		x				x	x	
Q4.1: Which persons accompany certain activities (AAL services)?		x				x	x	
Q4.2: Which person is the one to motivate elderly to do certain activities?						x	x	
Q5: At which particular places in the home of elderly, do they usually remind themselves of medication or appointments?			x	x				x

Q6: Which technologies are currently used by elderly and which will be accepted in the nearer future?	x	x	x				x	x
Q6.1: Which technologies are used by elderly?	x	x	x				x	x
Q6.2: Which attitude towards technology do elderly have?	x						x	x
Q6.3: Which attitude towards technical supported AAL services do elderly have concerning their future?	x						x	x

Table 2: Mapping of research question and probing material

3.1.4 Participants for Cultural Probing

The participants of the Cultural Probing were recruited according to the definition of the two AALuis end user groups. They should use medical and AAL services as offered by the project partners HWOe (see Appendix A) or 50plus (see Appendix B). Participants were recruited by these two organisations whereas 50plus concentrated on participants of user group 1 (lifestyle AAL services) and HWOe focused on participants of user group 2 (care AAL services). Although the two groups are rather different, especially in their orientation to lifestyle and care services, their tasks within the Cultural Probing were the same. The actual sample and their attributes are depicted in Table 3.

3.1.5 Results

Results are based on the delivered data (questionnaires, diary and photos) as well as the answers of the post-interviews. Below all results are summarized according to the postulated research questions. In order to ease readability we will refer to user group 1 as UG1 and user group 2 as UG2.

3.1.5.1 Q1: Which services are used in general and which motivations lead to it?

Q1.1 Which services do elderly use in their daily life?

Figure 2 shows the percentages of usage of different technologies in both groups. While some technologies are similar present in both groups such as TV, Big Button Telephone or Mobile Phone other technologies are more or less present in only one of both groups.

All participants watch at least once a day **TV**. The majority of participants watch TV selectively (news, documentaries or series). Further qualitative interviews revealed that the more leisure activities participants had and the more variety their days had concerning the diary entries the less TV was watched. Especially in user group 2, TV was an important daily amusement since some participants had hardly social contacts and their days were rather monotonous.

7/8 UG1 and 6/8 UG2 use a **mobile phone**. Participants of UG2 use a mobile phone for security reasons (mostly bought by family members). However use is random since outdoor activities are often not possible anymore. Participants of UG1 do a variety of leisure activities and want to stay in contact.

	<i>User Group 1 (more oriented to lifestyle services)</i>	<i>User Group 2 (more oriented to care services)</i>
<i>Total</i>	8 participants (3 male, 5 female)	8 participants (4 male, 4 female)
<i>Social</i>	<ul style="list-style-type: none"> Retired Living independently at home (4 alone, 4 with partner) Frequent contact to relatives and friends 	<ul style="list-style-type: none"> Retired Living independently at home (alone or with partner) needing care services to be able to live in own flat.
<i>ICT Knowledge</i>	<ul style="list-style-type: none"> Experienced using mobile phones Basic internet knowledge 	<ul style="list-style-type: none"> Experience with TV usage
<i>Physiological</i>	<ul style="list-style-type: none"> 64 – 77 years old (mean=68,63; sd=3,81) Normal sight or vision aids No age-related physiologic limitations No chronic diseases 	<ul style="list-style-type: none"> 72 – 84 years old (mean=78,88; sd=4,61) Less abilities in motor skills (e.g. danger of falling), but not bed-ridden In need of some type of medication
<i>Cognitive</i>	<ul style="list-style-type: none"> No cognitive impairment other than self-reported slight AAMI (Age Associated Memory Impairment)³ 	<ul style="list-style-type: none"> Slight dementia → multiple cognitive deficits that include memory impairment MCI
<i>Major technical environment</i>	<ul style="list-style-type: none"> Usage of Mobile devices and PCs (Smart) home components (e.g. TV) 	<ul style="list-style-type: none"> (Smart) home components (e.g. TV)

Table 3: Sample description

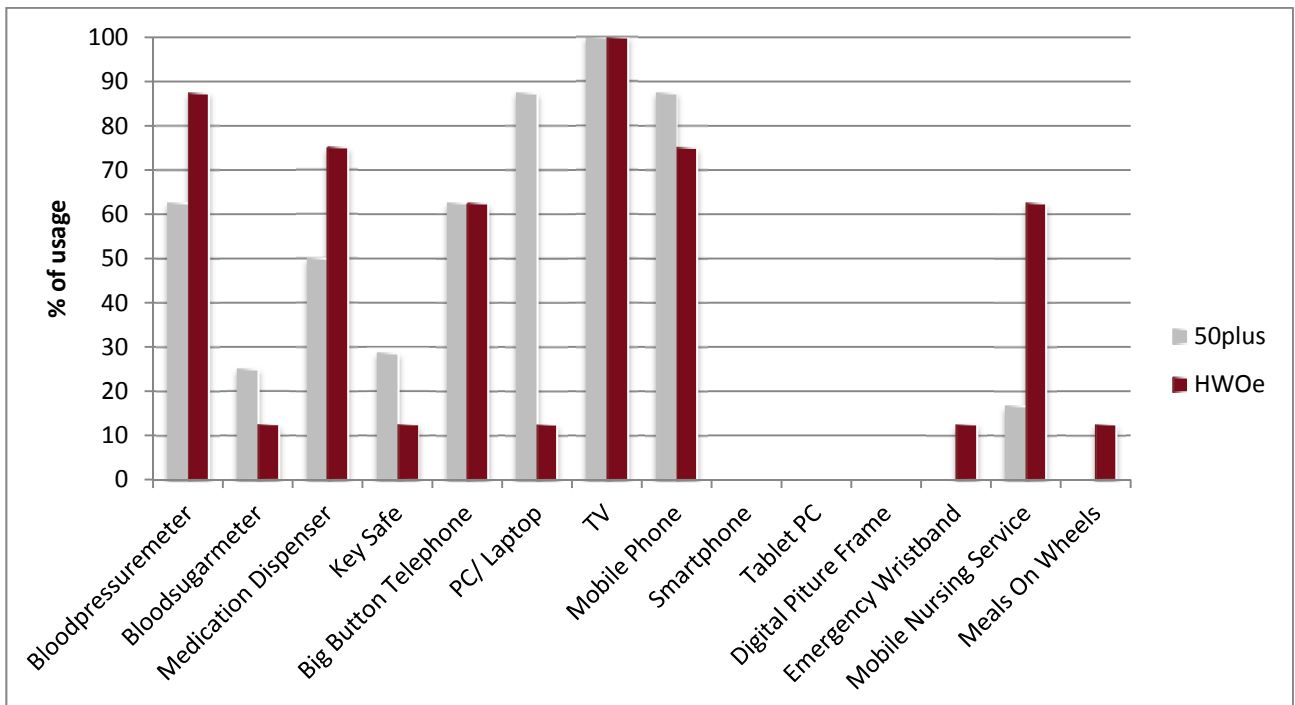


Figure 2: Percentage of usage of technological devices

³ AAMI (Age Associated Memory Impairment) is defined as a specific impairment in memory, not affecting other cognitive areas and that does not have effects on the Activities of Daily Living (self-care, hygiene, dressing, etc.), but affects their normal functioning because it interferes on the remembering of daily information.

7/8 UG1 and 1/8 UG2 participants use a **PC**. The only participant of UG2 using a PC had a technical educational background and had consequently little problems with the use of other technologies. PC users used the PC for information seeking and E-Mail, some for video chat with family members (e.g. in Singapore), photos and music and the participant of UG2 even for Internet shopping. Participants of UG1 reported that PC use makes fun and they found it necessary to keep up-to-date.

Assistive technologies such as rolling walker or medication dispenser are more used by participants of UG2. However, only 2/8 participants of UG2 use a **rolling walker**, although 5 participants have already a fall history and decreased mobility. Further, only two participants of UG2 have an **emergency wristband**. However, only one person really wears it, the other person keeps it in a box in the bed room. One participant of UG2 uses a gripping tong frequently. The gripping tong was acquired after surgery by a family member (daughter). 4/8 UG1 and 6/8 UG2 use a **medication dispenser** that had been recommended by caregivers (e.g. Hilfswerk).

Q1.2 Why do elderly use certain services?

Especially assistive technologies are recommended by doctor/caregiver (e.g. blood pressure/blood glucose meter, big button telephone, emergency wristband). These services are experienced reliable and easy to use (mostly daily used). Concerning TV or mobile phone usage family members have an important role as they often purchase the devices especially if the elderly are limited in their mobility and are not able to buy the technology on their own. Qualitative interviews demonstrated that the better the physical health of the participants was the more self-determined they were in buying decisions. This also applies for daily activities: healthy participants are rather self-determined and need no external motivation for leisure activities. Participants of UG1 have a high motivation for leisure activities and are partly motivated by friends (e.g. go on a journey). Participants of UG2 with limited mobility and consequently less leisure activities have a very low wish to do more activities since they have already accepted their constrained situation. In some cases external motivation would not have been possible since there were hardly any social contacts.

3.1.5.2 Q2: Which barriers and problems occur during daily life routine?

Q2.1 Which barriers occur due to constraints of physical condition?

11/16 participants were in therapy for physical problems (e.g. Arthritis, Parkinson, Depression, Muscoloskeletal system). Especially the participants of UG2 have rather heavy restrictions in their daily life due to physical problems. Most leisure activities are not possible anymore (see Figure 3). Decreased mobility due to physical condition is the most common factor for restrictions of leisure activities. For example 7/8 participants of UG1 reported to visit cultural events whereas only 2/8 participants of UG2 are able to do this anymore. This result is similar for travelling, handwork and voluntary work. One participant of UG2 would like to sing in a choir but participation is not possible for her due to stairs at the location.

6/8 participants of UG2 mention cycling as an important way of mobility which is not possible anymore (e.g. a woman in rural area can only drive by car into the city centre since there is no pavement, but she will have to give up car driving this year because the adhesive label of her car will run out). Referring to Figure 3 participants of UG1 are still able to do the activities they want to do in their leisure time while participants of UG2 can

do such activities only infrequently or not at all. Participants of UG1 can do less sports (hiking, skiing) than in former times but have hardly decreased mobility and are able to go for a walk or do excursions. Many participants mentioned nature as an important factor for their lives. Therefore, outdoor activities and a high mobility are necessary to experience nature.

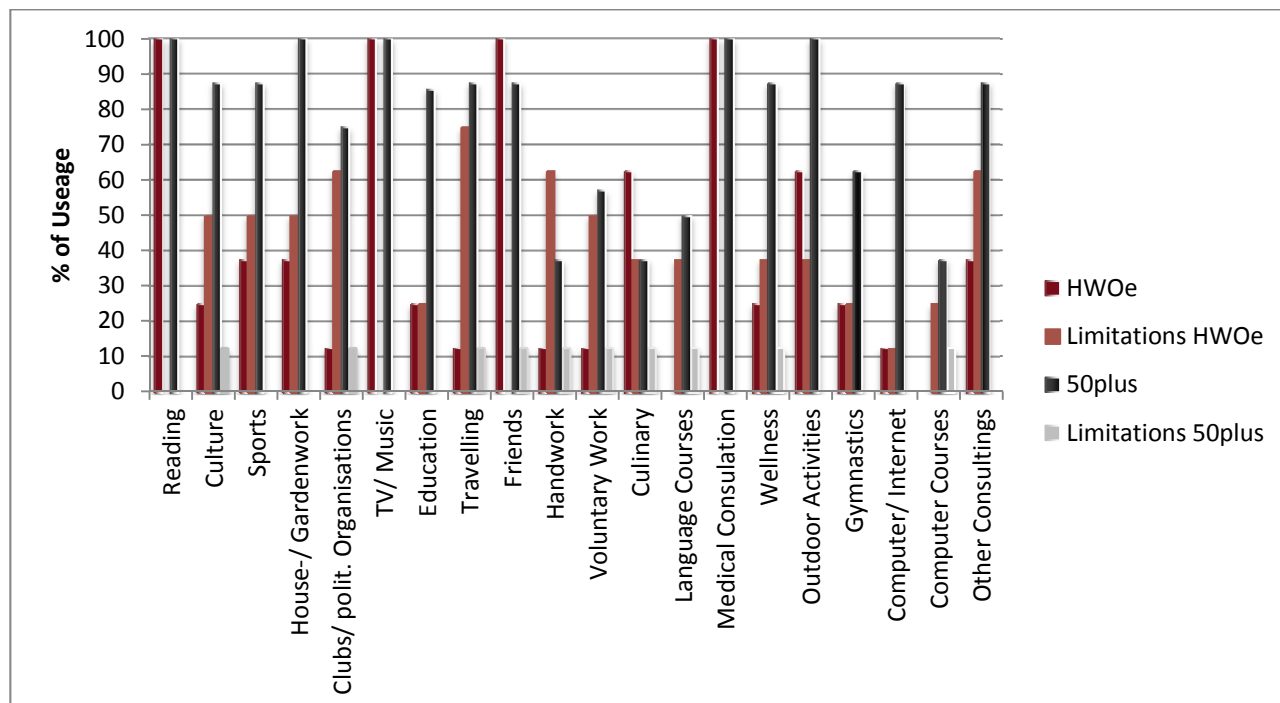


Figure 3: Leisure activities and reported limitations (HWOe refers to UG2, 50plus to UG1)

If participants were still able to drive a car they uttered the wish to do this as long as possible. One participant mentioned that driving at night was difficult because of decreased visual function. Means of public transportation are for most participants of UG2 no alternative for car driving since stairs in trains or buses are serious barriers. Furthermore, the majority of them lived in a rather rural area with weak public transportation.

Furthermore, participants of UG2 have problems in activities of daily living. Two persons were not able to get dressed, put on socks and get up of bed or chair. 5/8 participants of UG2 were not able to do household activities or gardening anymore. They pointed out that they would like to do housework/gardening but cannot anymore due to physical limitations. These tasks were done by caregivers (HWOe), neighbours or family members. The participants of UG2 got used to these restrictions. They have almost no motivation to change things in their lives and have mostly accepted these restrictions as „*course of time*“.

Q2.2 Which barriers occur within the usage of AAL services?

In general, participants do hardly report about problems with technical devices when asked about. Especially participants of UG2 are rather easy satisfied since they do not have high expectations of their technology and mostly use basic functions of their technology. Further, they are not interested in learning to use their devices in all their variety of functions properly. Functions which are too complex to conduct are simply ignored (e.g. teletext of TV) or family members have to help (e.g. TV program scan mode, address book mobile phone). Participants of UG1 are more eager to understand the

technology they use and have higher expectations of their technology since they often do a lot of research before they buy a new device. They are especially aware of problems with their PC because they feel that they are not able to solve them on their own. Moreover, they attribute problems with PC or mobile phones to decreased fine motor and visual skills.

When asked about potential solutions for barriers occurring in their daily lives participants of UG2 suggested the following:

- Medication dispenser pockets too small => bigger boxes
- If diaper during night gets too wet, whole bed is wet => diaper sensor
- Screw caps and glasses difficult to open => no idea
- Difficult to walk with the rolling walker uphill and downhill, climbing stairs not possible, difficult to make turn => no idea
- Use of mobile phones difficult (fine motor skills) => voice control

Although they are faced with plenty of problems on a daily base they are only able to suggest straight-forward solutions.

Concerning technical devices, 4/8 participants of UG1 and 6/8 participants of UG2 find instruction guides helpful. Mentioned problems of instruction guides are: too complicated, small fonts, ambiguous expressions, insufficient or not available (e.g. Internet). Figure 4 shows the distribution of persons who were consulted by the participants in questions about how to handle new technical devices. While participants of UG1 refer to various persons including sales assistants participants of UG2 rely almost entirely on the opinion of their children and grandchildren.

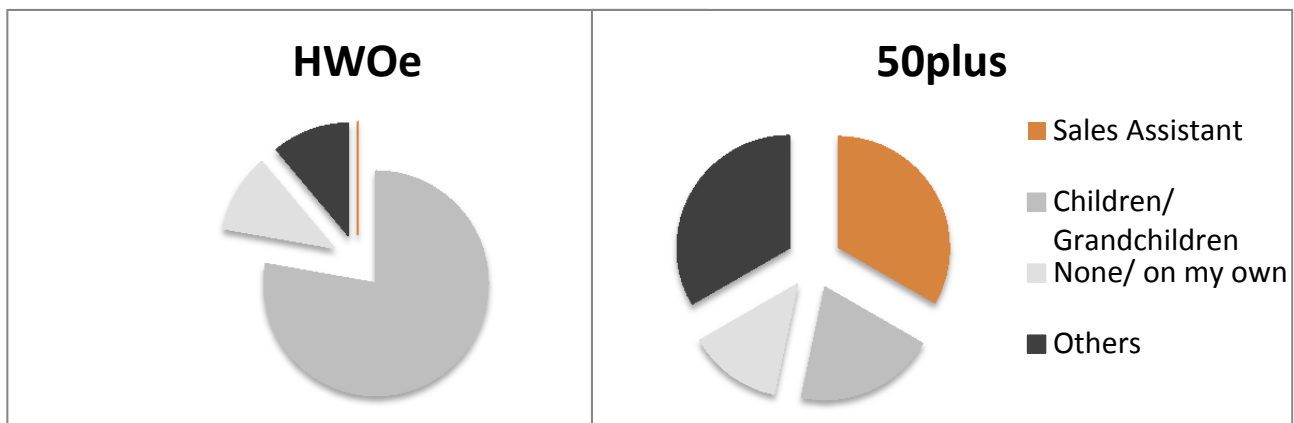


Figure 4: Persons asked if new advice is bought (HWOe refers to UG2, 50plus to UG1)

3.1.5.3 Support and influence on usage of AAL services (Q3+Q4)

Research questions 3 and 4 can be subsumed since significant persons of the social net support and at the same time influence the elderly. Significant persons who support and influence the elderly are:

- Family members (spouse, children, grandchildren)
- Friends
- Neighbours
- Caregivers (HWOe, Assisted Living)

- Counselling in shops (for influence of AAL services)

The majority of the participants of UG1 have a very active family life with spouse, children and grandchildren, lots of family activities and taking care of their grandchildren. Others have frequent contacts with friends and do leisure activities together. The participants of UG1 are very self-determined and first try to solve problems on their own before asking children, grandchildren or friends and neighbours. They do not need external motivation for their activities since they are very active on their own. According to the diary we could state the more interests a person has the more flexible and variable is the daily routine.

Most participants of UG2 also have family support but relationships are more one-way and elderly are more dependent from their relatives (respectively caregivers). The lower their mobility the more activities take place at home and alone (e.g. reading, watching TV). Activities are little flexible and are defined by time schedules of senior meetings or playing cards with neighbours once a month. Visits of family members are mostly only at weekends or if family members live farther even less frequently. Because of their dependence of others participants of UG2 are more restricted in their flexibility of activities.

3.1.5.4 Q5: At which particular places in the home of the elderly do they usually remind themselves of medication/appointments?

In both groups taking medicines is a fixed part of the daily routine: participants take medicines before meals in the morning and/or evening and it is as *“natural as personal hygiene in the morning”*. Medication is positioned on the kitchen table in special boxes or medication dispensers. If there is a spouse, s/he is responsible for medication and the other way round.

Since participants of UG2 have rather few appointments daily routine is very strong and appointments are a welcome change. Appointments are usually calendared and have to be organized well if escort is necessary (e.g. medical consultation). Participants of UG1 have rather diversified and long days. They have a paper-pencil calendar for organizing dates.

3.1.5.5 Q6: Which technologies are currently used by elderly and which will be accepted in the nearer future?

Q6.1 Which technologies are used by elderly?

Table 4 shows that some technologies are used by the majority of elderly and some are rather randomly used.

<i>Technology used by the majority</i>	<i>Randomly used technology</i>
TV	Blood glucose meter
Mobile phone	Rolling walker
PC	Key safe
Blood pressure meter	Emergency wristband
Medication dispenser	Hearing device
Big button telephone	Gripping pliers

Digital camera	Microwave
Radio	Coffee machine
Sat receiver	Kitchen aid
	Scales
	Vacuum cleaner (hand, robotic)
	Alarm clock
	Dish washer
	Smartphone
	Tablet PC
	Digital picture frame

Table 4: Technologies used by the majority or minority of the elderly participants respectively

Participants of UG2 were not willing to name favourite technologies they named only frequently used or important devices. This could be interpreted in the way that technologies do not have a significant value in their lives: technology has to be useful and easy to handle. Furthermore, problems with technologies were mentioned scarcely, because participants were not aware of them: as soon as a device or function of a device seems to be too complex it is ignored and not used anymore (e.g. teletext or TV).

Q6.2 Which attitude towards technology do elderly people have?

Participants of UG2 are strongly attached to the time they have grown up. Only one participant with PC had an engineering educational background. The majority avoids new technology and have to be convinced by their family members to buy new devices (e.g. mobile phone). Due to long-term physical constraints leisure activities are rare and there are lots of daily limitations which make occupation with technology unimportant.

On the other hand, participants of UG1 are eager to learn new things even if it takes longer but devices must not be too complicated and personal assistance is perceived as more helpful than instruction guidelines (especially concerning computer courses).

Below a summary of attitudes for the most important devices of both user groups:

- “Wearable devices should be wearable”
 - Emergency wristband is hidden under the pullover, because it is ugly; sometimes not worn at all but kept in a box
 - Rolling walker: often left at home, because it feels uncomfortable to be seen with. Uphill/downhill/ around the corner difficult, climbing stairs not possible
 - Hearing aid is scarcely used *“it is difficult to use when several persons are around, but I don’t use it when talking to only one person, either”*
- Gripping pliers: helpful, extension of mobility
- Radio is used in the morning mainly; daily entertainment
- Digital camera: usage ranges from daily (hobby) to scarcely; *“brings the outside-life to the elderlies home”*

- Mobile phone: majority only uses a mobile phone to call someone, only some know how to read SMS but not usually not how to write one; alarm clock, watch, calendar (birthdays), photos; “*buttons and display too small*”; headset for voice in- and output
- PC: information, communication, shopping etc.; daily use; basic and advanced computer courses helped a lot, persons for immediate trouble shouting were contacted (neighbours, children, friends, trainer, remote desktop), *personal help appreciated no online tutorials!*
- TV: for entertainment; selected films and documentaries, news; daily use; “*remote is far too complex*” “*I don’t have a full understanding of the device*”; provide a course about how to use all functions of my new TV

Fehler! Verweisquelle konnte nicht gefunden werden. shows a summary of attitudes to different technology statements. The figure reveals that there are mostly huge differences between both groups. Especially the point „Technological innovations, like mobile phones or internet help me to organise my life better“ is very contrary answered by both groups: while participants of UG1 rather agree, participants of UG2 rather disagree. Besides answers for the statement „Disadvantages of some technologies have to be accepted“ are interesting. Here participants of UG1 rather disagree while participants of UG2 are more willing to accept disadvantages which could be confirmed in the qualitative interviews: problems of technology were hardly reported.

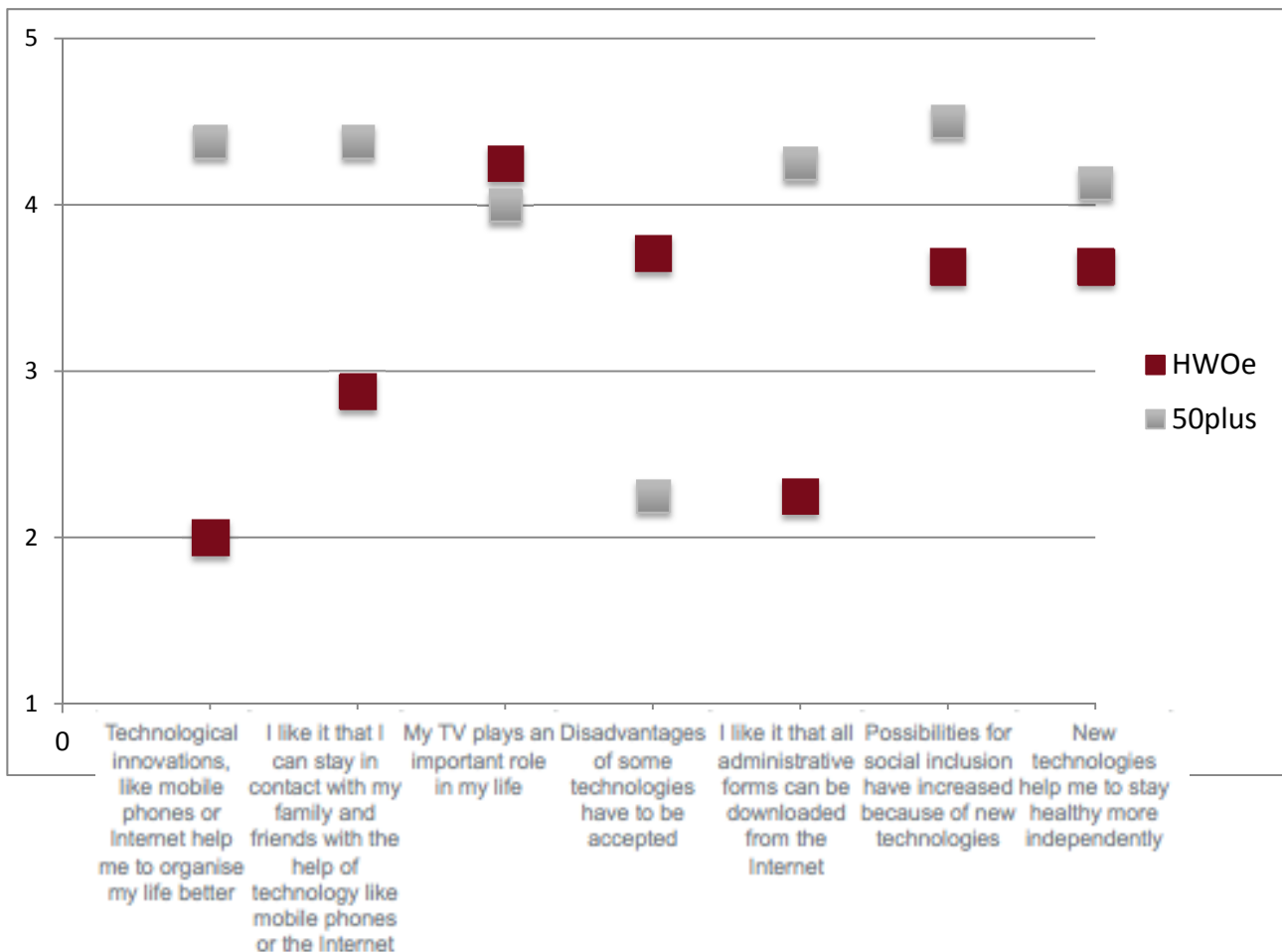


Figure 5: Attitudes towards new technology (HWOe refers to UG2, 50plus to UG1):

While 3 represents a neutral attitude higher numbers stand for rather agreeing while smaller numbers mean rather disagreeing.

Q6.3 Which attitude towards technical support do elderly have concerning their future?

Participants of UG2 do not concern themselves with their future. In the interviews they reported to see every day as a gift. All participants of UG2 had the wish in common to live as long as possible independently at home. However, they want to change as little as possible in their homes (e.g. one participant could not take stairs anymore but a stair lift would mean too much rebuilding in the house). Robotic assistance or care based mainly on technical devices is not imaginable and rather a “horror” vision.

Participants of UG1 are not averse to technical support, but social aspect of care is experienced as important. In order to live as long as possible independently some participants mentioned following necessary aspects: usability and accessibility of buildings, easy to use devices, cheap technology and personal assistance for complex devices such as PCs.

3.2 Focus Groups for evaluating the end user scenarios

The aim of the evaluation of the scenarios by members of every group was to get feedback and suggestions for improvements for AALuis. End user related scenarios were discussed in focus groups for two reasons: face-to-face meeting with end users bring up valuable exchange and discussions that cannot be replaced by surveys. The other reason is that older adults are typically not familiar with online surveys especially the members of UG2. One two hour focus group for each of the both end user target groups has been conducted to get qualitative feedback from possible end users. The focus group was structured into four parts: introduction, communication behaviour, discussion about scenarios and brainstorming about further ideas. During the introduction we explained the idea of AALuis shortly and asked for informed consent. An open discussion was applied to get an overview if and how ICT services are used for communication purposes, but as well to get an impression of how the participants’ social environment is composed. Afterwards, the end-user-related scenarios were read out loud by one of the participants and were then discussed in the group. The focus group leaders posed some questions on how realistic, useful and usable the respective service was considered. Finally, we asked for further service ideas in the form of an open brainstorming session. In the following we will describe details and particularities for the both end user groups as well as the results of each focus group.

3.2.1 User Group 1 (more oriented to lifestyle services)

On the 1st of February CURE and 50plus organised a focus group in the 50plus Centre in Salzburg, Austria. All participants attended at least one of the courses offered by 50plus and still were quit active after their retirement. Seven female and three male persons - all retired, an employee of 50plus and two workshop leaders of CURE took part in the focus group. For this group we decided to discuss not only the three end user scenarios but also *SP_MC_1 – The new Good-Morning-Service* as the use case connecting persons with the help of an intelligent touch table seemed promising to the consortium.

3.2.1.1 Communication Behaviour and Activities

The majority of the participants communicates mainly with family members (spouses, parents, children, grand-children) but also with friends, former colleagues and acquaintances of courses. The motivation to attend courses at the 50plus Centre is mainly because of special interests e.g. in learning foreign languages or using a computer and for one participant also because of loneliness. Means of communication include talking with telephone or mobile phone, writing SMS, e-mails and sometimes letters. In this respect members of User Group 1 seem to use today’s usual technology.

However, a discussion on the usage of social network services like Facebook⁴ evoked by one of the participants who uses this platform to stay in touch with his grand-children brought up interesting insights. Just two of the other participants also have a Facebook account, but they don't use it anymore. They are irritated by receiving auto-generated e-mails and they are afraid of being deceived or stalked. Additionally, it was mentioned that the amount of contacts is unmanageable and the "quality of so called friends is dubious". The fourth person who uttered herself about Facebook is absolutely against joining social network services because she does not want to "spread her private life throughout the world." Obviously privacy is very important for older adults and corresponding concerns as well as fear of loss of control about their data rather lead to refusing social network services. One of the other participants had registered to MyHeritage⁵, but is also anxious about it because of the private data she has to enter. The main problem with the usage of social networks seems to be the lack of knowledge on how to protect privacy, as well as security concerns.

The participants still were quite active and named the following frequently used *services* and *activities*: courses offered by 50plus, cleaning aid, surfing the internet, table tennis, gymnastics, walking, swimming, skiing, hiking, theatre, concerts, playing cards and physiotherapy. The general problem with the most of the discussed activities is rather due to time or financial constraints than to physical limitations.

3.2.1.2 Scenario EUP_3 – James, 68

The first comment on the scenario was that the host-organisation 50plus provides retired people with similar services, just in a more personal way. On the other hand it was argued, that the anonymity might make it easier for James to get in touch with other people and to make new acquaintances with people sharing the same interests.

All participants emphasised that there is need for a person who shows the user how to handle the shown technology (Social TV) in the first place but also to provide the base to understand the concept and the guiles of social network services ("who is able to see what I contribute" etc.). The participants were rather sceptical about the replacement of a common "buttoned" remote with a tablet PC: A haptic feedback and knowledge about the position of the respective buttons has to be considered. If the remote was replaced with the tablet, it would be hard to find the corresponding buttons, especially if they were as small and the sight of the user was lowered. The participants stated that habituation when dealing with technologies is an important factor for them. This supports the findings of the Cultural Probes study that habits should supported and changes need to be argued carefully.

When it comes to personal digital assistants (avatars) the participants judged a person-like (e.g. their children-like) avatar positively but also stated that they would not need it because they have enough social contacts. Nevertheless, they could imagine that it might be useful for a lonesome person. This shows that they regarded the avatar mainly as a substitute for social contact. Interestingly the half of the participants also stated that they might find it helpful in terms of a virtual tutor on several ICT-driven services.

3.2.1.3 Scenario EUP_2 – Gertrud, 81 and Alois, 79

In general the scenario was perceived as realistic and the use of the AALuis service as imaginable. Only one participant did not like it because she thought that the couple in the

⁴ www.facebook.com

⁵ www.myheritage.com

scenario should rather support each other instead of relying to a technical system. All participants appreciated the reminder function because they remember how they have or had to contact their parents over and over again to remind them of taking medicine or to keep an appointment. This shows that people from UG1 don't regard themselves as target group for such a scenario.

The grandchildren avatar was appreciated as well but only for lonely persons. Most of the female participants appreciated the reward-system (applause of the grandchild-avatar) itself. In addition a reward like bonus points for the health insurance for extra physical activities or regular medication was proposed to motivate the elderly person. However, the majority of the participants stated they would not need this additional motivation for themselves.

Again security and privacy concerns were mentioned. They were concerned about the dissemination of the measured physical data. Family physicians and medical organisations (e.g. Samariterbund or Hilfswerk) as well as good friends are trustworthy persons who would be appropriate to suggest (introduce) a system like the one of this scenario to the respective users. Additionally, it is important that usage and background knowledge (fear of being placed under disability) is explained in an elderly-related way by a trustworthy person.

3.2.1.4 Scenario EUP_1 – John, 75

Again, the participants did not think about themselves when considering this scenario. Instead they remembered themselves when taking care for their own parents. They reported on the continuous fear of not knowing about the recent physical state of their infirm parents. In addition, the scenario is only imaginable when the user lives alone at home.

The touch table itself is perceived as useful for e.g. reading the newspaper (enlarge), but also other applications like cognitive games. The table is also conceived as possible living room furniture. Nevertheless, the use case with the medication leaflet is regarded as obsolete for themselves because they know very well how and when to take which medication.

3.2.1.5 Scenario SP_MC_1 – The new Good-Morning-Service

“The new Good-Morning-Service” scenario was perceived very positive. Nevertheless, face-to-face communication would be better. Despite that, the participants perceived the service as quite useful especially for lonely persons and also with the help of the touch table. So the touch table was mentioned again as an interesting device they would like to try out.

On one hand this scenario means an “improved communication” over the internet and elderly people living alone might feel less lonesome, on the other hand caring relatives that call would be more appreciated.

3.2.1.6 Final Discussion

In the final discussion it was asked which scenario was perceived best or worst respectively. Most of the participants were in favour of “The new Good-Morning-Service scenario”, because it has a *personal social component*. People interact with real people, who are in a similar situation.

A *health monitoring system* is also appreciated but it was claimed that *mobile solutions* would be more appropriate for UG1 since they are very active and mobile. It was suggested to have fall detection or blood pressure measuring on the go (e.g. when going

hiking), that alarms in cases of emergency or gives advice to slow down and relax. The emergency call centre should get immediately information of where an injured person is who this person is and what health record he or she has.

The *touch table* was appreciated by all but one participant. She just did not want to have such a “huge piece of technology” in her living room.

Most of the presented AALuis scenarios are too far away from the daily living of UG1. They do not consider using the services right now, but could broadly imagine that they might be or would have been of use for their parents-generation.

Additionally they gave the advice to *enlarge buttons and fonts*, because they think that this is one of the most frequent reasons for them to put a device of new technology away. Even though they were asked to not consider costs this question arose again and again. They mentioned that they would not be willing to pay a lot for an AALuis-like system and that the acceptance would be better if users could keep their own devices.

3.2.2 User Group 2 (more oriented to care services)

On the 23rd of February CURE and HWOe organised a focus group for members and relatives of User Group 2 in St. Pölten, Austria. The participants consisted of clients of HWOe who needed frequent care and of informal and formal caretakers as well as associates of HWOe: one female (77 years old) and two male clients (80 and 90 years old), two formal and one informal carer, three associates of HWOe as well as two workshop leaders from CURE.

The degree of impairments and need for support in daily routines was given with all three clients. The formal and informal caregivers as well as the co-workers of HWOe contributed with their experience and their suggestions for support of clients and carers. The clients were all hardly able to walk, 2 were rather active and one had Parkinson. All were very talkative.

As only two scenarios are directly targeting users of UG2 and due to the constitution of the invited clients we concentrated in the discussion at these two scenarios (EUP_1 and EUP_2). However, it was rather difficult to focus on the scenarios because the participants of UG2 tended to deviate from the topics and told from their experiences. Nevertheless, it was very interesting and gave valuable insights for AALuis.

3.2.2.1 Communication Behaviour and Activities

Communication of persons of UG2 concentrates mainly on spouses, children and formal caregivers. Grandchildren and friends don't play a big role for communication anymore. Apart from personal visits telephone and mobile telephone are used but mainly in a passive way. One participant had 2 mobile phones: a big button phone especially for elderly people and a feature phone. Additionally he is thinking about buying a smartphone, however, the workshop leaders had the impression he would hardly be able to use it due to his impairments. One participant is phoning once a week his wife who is currently on rehab. The other participants have a mobile phone but it usually lies out of range and is not answered.

One client said he uses a computer with Internet to look up jokes. He claimed that these were his only activities with the PC. He is not playing any games on his computer or surfing the internet for news or other interesting information (e.g. weather information is gathered over the teletext on the TV).

Another client is cooking and doing the laundry for himself as his son who is working a lot is seldom at home. Additionally he is gardening a lot in spring, summer and fall, caring for

his fruit trees and cooking marmalade. These activities need to be very challenging due to his physical impairments: for walking he requires a cane and both hands suffered from severe arthritis. When asked for his activities he rather spoke about his experiences in the Second World War than about recent activities.

A walking aid (rollator) is a frequently used and accepted tool amongst the participants. One participant uses a gripping tongue although she did not like it at all at the beginning. However, when she experienced the benefit of this tool she continued to use it. She now sees it as a usable tool for her daily routines. She claimed that she behaves the same with every new technology she is given: as soon as she tries it out and experiences the benefit she tends to use it instead of insisting on the uselessness of this tool. However, she pointed out that she only uses new tools when her family gives it to her. She said for doing them a favour.

All participants had a TV. While two use it on a daily basis and several hours a day one client rarely watches TV because of his activities in his garden. He claims that he has no time for watching TV and is rather listening to the radio.

Interestingly, the participants claimed that problems with the most activities exist rather due to time or financial constraints than to physical limitations. These are already regarded as given and “normal”.

3.2.2.2 Scenario EUP_2 – Gertrud, 81 and Alois, 79

The participants agreed that the scenario could be helpful for the persons described in this scenario. However, they did not consider it as helpful for themselves. The caregivers pointed out that user who require medication and tend to forget their medicine usually assume and affirm that they have taken it. In comparison to the younger elderlies of UG1 it is even more important for UG2 to involve relatives in the purchasing process of AALuis. One participant said she only uses devices that her children or grandchildren have provided her.

Although the participants were rather sceptical concerning the avatar and the (additional) speakers the idea of TV-based reminders in general was liked. A problem of reminders just relying on speakers might lead to confusion when not totally understood by the users.

In general, for the target group UG2 a PC- or smartphone-based solution like presented in this scenario seems not eligible. Like already stated in the Cultural Probing study it is very difficult to bring new technological devices to this target group. Additionally, existing and known devices like the TV should be leveraged. If impairments lead to problems with controlling the TV by hand (using the remote control), voice control was considered as interesting alternative.

3.2.2.3 Scenario EUP_1 – John, 75

In comparison to UG1 monitoring health data was more appreciated by the participants of UG2. Due to bigger health problems the medical necessity leads probably to this more positive attitude. Another use case that came up in the discussion was using videoconferencing with the doctor for routine examinations or spontaneous problems to avoid the efforts of visiting the doctor. Also in general TV-based videoconferencing was appreciated e.g. in order to talk to friends that cannot be visited anymore.

The idea of using a touch table was rather discussed in the context of controlling smart home components than with help manuals. The consent was that the idea is nice and usage is imaginable but disadvantages were found: (i) it would be bad if the table leads to less movement at home; (ii) one participant installed a remote control for jalousies some

years ago and don't want to exchange it. The caregivers meant that this scenario could be helpful for some persons of UG2 but it really depends on the kind of impairments.

3.3 Summary and Implications for AALuis

In this section the results of the Cultural Probing and its associated interviews as well as the discussions of the focus groups are summarized. Corresponding implications are elicited and numbered by a unique identifier to refer to a certain end-user requirement. It should be the prefix 'E' followed by a dash ('-') and a digit for the requirement (e.g. E-01).

Motivation

- Data analysis and qualitative interviews show that especially older elderlies have low motivation for changes.
→ E-01 leverage already present technologies in the homes of elderly (TV, PC, mobile device)
- Younger elderlies do not regard themselves as old and are therefore rather motivated to learn how to use new technologies (staying up-to-date)
→ E-02 however: Benefits have to be emphasized, fears have to be dispelled
- Family is a very motivating entity
→ E-03 family should be addressed and included into service offers
- Older elderlies are organised persons, older elderlies stick to strict daily routine, younger elderlies stick to paper calendars
→ E-04 support existing habits and don't force them to change
- Usage of medical devices is common and perceived usefulness and usability is high (part of daily routine, recommended by trustworthy person)
→ E-05 High reliance on trustworthy authorities or friends

Trust

- Older elderlies are rather sceptical concerning new technology, especially older elderlies often regard it as useless
→ E-06 New technology should be explained by a trustworthy person (doctor, friends, family)
- The refusal of technologies might be explained by the fear to replace personal social encounters
→ E-07 Benefits have to be emphasized, fears have to be dispelled
- Recommendations leading to technology usage rather from friends and medical professionals than from (younger) family members
→ E-08 Medicals and Care organisations should be contact persons
- Elderlies are very aware of privacy issues and therefore rather refuse using social network services. The benefits are not clear enough. They fear to lose control and to not being aware what can be seen by others
→ E-09 Careful explanations about control mechanisms and benefits is necessary when social media and connected health services shall be used by elderlies
- Concerns about privacy also lead to sceptics against connected health services. Obviously the lack of understanding the technology increases the fear
→ E-10 Data handling needs to be explained to the elderlies

Technology usage

- High affinity for TV – even more important for older elderlies
→ E-11 TV is an important device that should be included
- TV remote control is rather complicated, just a subsection of functionalities is used; however, due to habituation it is perceived as useful
→ E-12 Exchange of remote control (to touch device) needs to be explained carefully
- Mobile devices are especially for younger elderlies (YE) important (higher mobility but sorrows exist)
→ E-13 YE: Mobile devices are appreciated but have to match their needs
- Due to physical problems older elderlies (OE) tend to stay at home
→ E-14 OE: Home solutions (smart homes) rather than mobile devices
- Instructions manuals are perceived as rather complex, but are used anyways (high paper affinity); online tutorials are usually ignored
→ E-15 Enhancing interactions with instruction manuals by leveraging digital paper might be an option

Implications due to physical impairments

High diversity of elderlies and their problems concern interaction modalities:

- People with vision impairments require voice in- and audio output
- People with hearing problems need rather visual modalities, however voice input could be possible as well
- People with impairments in fine motor skills also from audio in- and output modalities

→ E-16 Design needs to be optimised for older people

→ E-17 Audio controls are in general highly appreciated by elderly

→ E-18 Studies showed that touch-based input is easy-to-learn (when designed right) [3], in the focus group it turned out that a touch table seems to be interesting for elderly

4 Stakeholder Requirements

As one of the main goals of AALuis is the development of a special AAL middleware layer the wishes and needs of corresponding stakeholders is very important for the success of the project.

4.1 Online Survey

In order to gather a higher amount of opinions we decided to use online surveys to contact the two main stakeholder groups of AALuis: service providers and developers. As the provided services to older adults differ widely we additionally distinguished between caregivers and monitoring centres.

4.1.1 Approach

To give the stakeholders an idea about the plans of AALuis we included the relevant scenarios (see D1.2) in the survey. To each stakeholder group two of the according scenarios were presented and asked them about their opinion and attitude. We asked the caregivers about the scenarios SP_CG_1 and SP_CG_2, the monitoring centres about the scenarios SP_MC_1 and SP_MC_2, the developers about the scenarios SP_DEV_1 and UI_DEV_2. As the role of a stakeholder cannot be determined in a distinct way and tasks overlap we decided to send out just one link to the relevant contacts of the consortium partners and to include a screening question in the beginning. Thus the participants classified themselves and chose the questionnaire version that fitted best to their role. After the screening question the first of the two corresponding illustrated scenarios was presented and questions about similar situations, additional helpful use cases (open format), whether the scenario was realistic or not, on the probability of adding similar features to their organisations service offers, on the probability of expense reduction for their organisations, how helpful the service for end-user might be, statements related to the service presented in the scenario (bad-good, unwise-wise, harmful-beneficial, unpleasant-pleasant, worthless-valuable, joyless-enjoyable) were posed. Additionally it was asked whether the integration of the service makes the organisation of the respective organisation easier and whether the service or components of the service could be too impersonal. We were also interested in the probability of offering such a service with their organisation and the according reasoning why the service is not helpful/ helpful and suggestions for improvement for the service depicted in the scenario. After the first scenario the second stakeholder-specific scenario was presented and evaluated in the same way as the first scenario. In the end of the survey participants were asked to give some information on AALuis in general as well as on their organisation. The survey was created in GlobalPark⁶ and sent out via a survey-link included in an e-mail sent out to 711 former and recent partners of the AALuis project consortium. The response rate was about 14.91%. A full version of the survey (in German and in English language) can be found at the internal project platform (Sharepoint) or acquired by asking the coordinator.

4.1.2 Results

In the following section the results of the online survey will be described in detail. First we present some general information on the participants and participating organisation. Afterwards, the results of the three stakeholder groups will be reported in detail, followed by their general opinion on AALuis. For readability reasons we moved the longer tables presenting the results to open questions (Table 19 - Table 42) to Appendix D.

⁶ <http://www.globalpark.co.uk>

4.1.2.1 General information on participants and their organisations

All in all 106 participants responded to the invitation. 88 participants filled out the survey to the end, 18 quit the survey at some point and did not continue (see Table 5). The participants classified their organisations as shown in Figure 6.

	<i>Service provider</i>	<i>Care giver</i>	<i>Developer</i>	<i>Total</i>
<i>Final</i>	17	37	34	88
<i>Cancelled</i>	1	9	8	18
<i>Total</i>	18	46	42	106

Table 5 Summary on survey participation

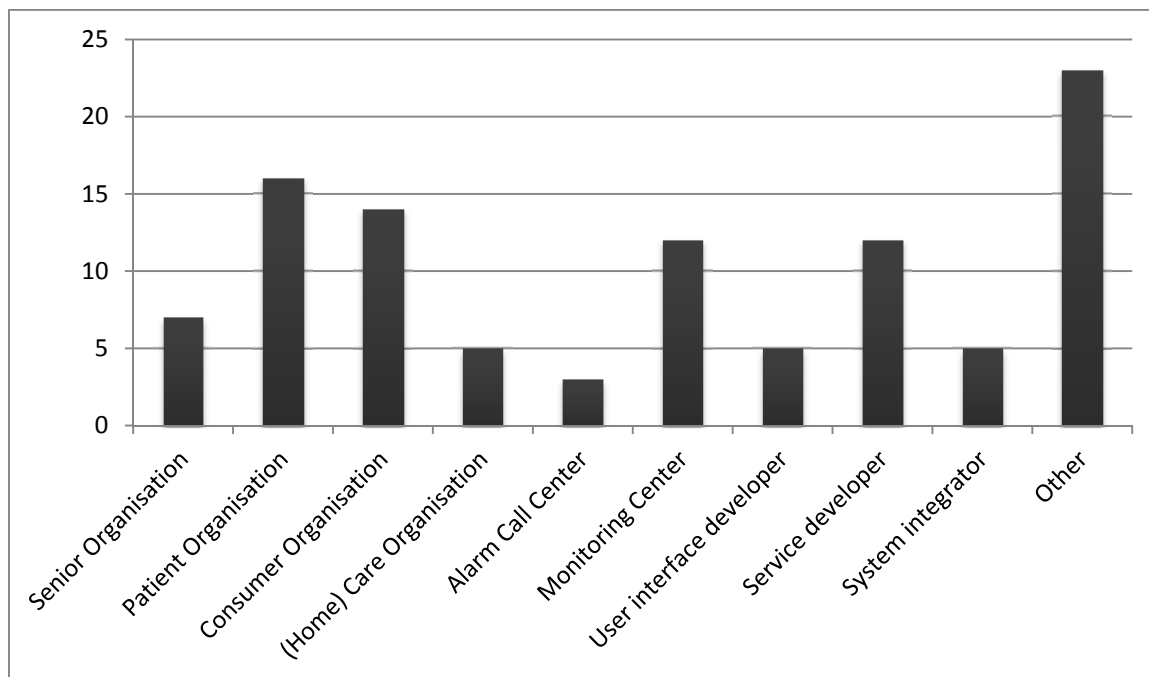


Figure 6 Frequencies of class of organisations that took part in the survey

The survey was sent out to partners and other acquaintances of the project consortium throughout Europe. The participants were asked to indicate in which European countries their organisation operates. The answers are depicted in Figure 7. As the coordinator and the majority of the project partners are from Austria the high amount of organisations operating in Austria is not surprising. Probably for the same reason Germany and the Netherlands were often indicated. Nevertheless, also bigger European countries like Spain and the UK are mentioned several times.

We asked for the *experience* the organisations have concerning *Ambient Assisted Living (AAL) services*. 50 organisations are concerned with AAL services, 35 are not. 10 organisations have experience between 1 to 3 years, 28 between 4 and 10 years, 16 between 13 and 20 years, and 1 organisation has 30 years of experience.

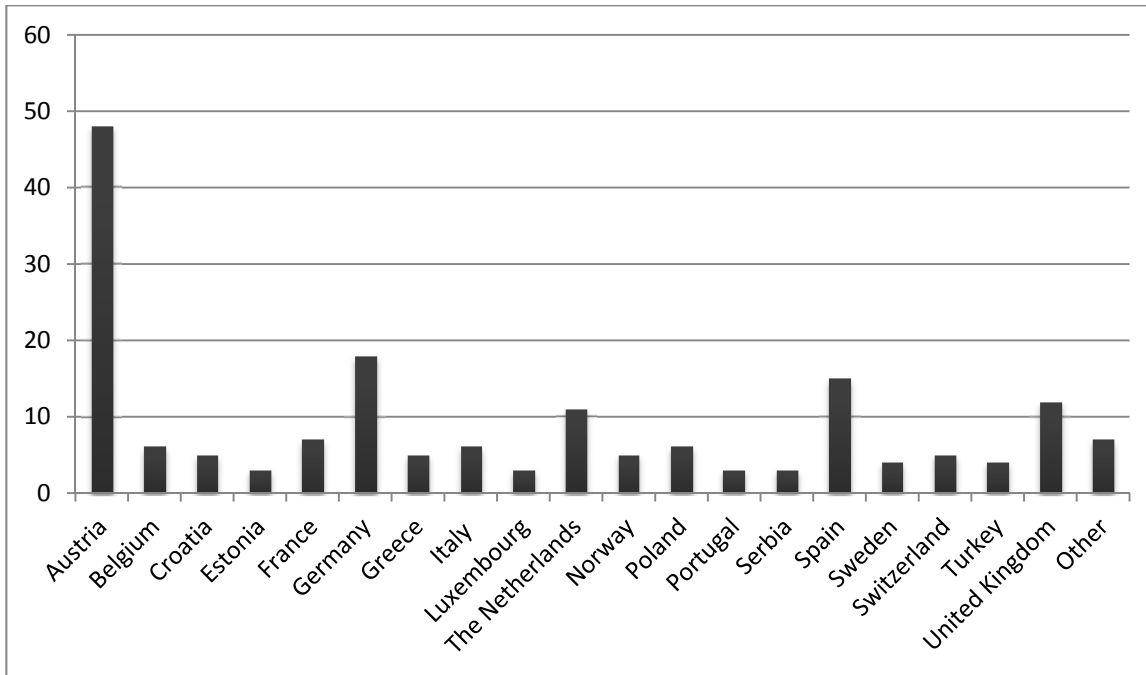


Figure 7 Frequency of operating countries of participants' organisations

4.1.2.2 Service Providers/Monitoring Centres

18 of the 106 participants classified themselves as monitoring centre and had a look at the accordant scenarios.

Scenario SP_MC_2: Intervention Service

11 of 18 participants reported that they knew similar situations as described in this scenario, 2 were not sure and 5 did not know any similar situations. Participants' suggestions about possible use cases of AALuis in this context that might be helpful for their day-to-day business can be found in Table 19 **Fehler! Verweisquelle konnte nicht gefunden werden.**

4 of the 18 participants reported that the scenario is rather not realistic, 3 were not sure, but 11 thought that it is rather or definitely realistic.

4 participants would (rather or definitely) not *add a feature like* the Intervention Service to their service offers, when it becomes available. Another 4 were not sure about it and 10 would (rather or definitely) add scenario-like features when available.

When the participants were asked whether the Intervention Service could *reduce expenses for their organisation*, answers are quite discordant. 1 participant/organisation is not concerned with it, 7 think that a service like shown in the scenario would not reduce any costs, 4 are unsure, and 6 are quite sure about potential expense reductions.

When asking whether the *end user could benefit* from the Intervention Service all opinions go in the same direction: 6 participants responded that they are not sure, but 12 service providers were rather sure about the benefits for the end user.

The participants were also asked to *rate the following characteristic* of the scenario on a 5-point semantic differential ranging from 1 to 5. The results can be found in Table 6.

<i>5-point semantic differential</i>	<i>mean ± sd</i>
<i>bad – good</i>	3.28 ± 1.57
<i>unwise – wise</i>	3.28 ± 1.23
<i>harmful – beneficial</i>	3.50 ± 1.43
<i>unpleasant – pleasant</i>	3.44 ± 0.99
<i>worthless – valuable</i>	3.11 ± 1.45
<i>joyless – enjoyable</i>	2.94 ± 1.43

Table 6 Mean and standard deviation of characteristics ratings on 5-point semantic differential

The majority of the participating service providers (10) considered the Intervention Service to make the *organisation of a monitoring centre easier*. 5 persons declined this statement and 3 were not sure.

At the question whether an *avatar-based digital personal assistant* as shown in the scenario might be too impersonal the opinions were evenly divided. 6 out of 18 participants meant that an avatar was too impersonal, 6 were not sure and another 6 were in favour of the avatar.

5 participants were rather sure that a service like the Intervention Service could not *support their organisation*, 1 was unsure and 11 respondents were quite sure that such a service could help their organisation. We also asked the participants to *explain their answer* and to make *suggestions of improvement*. The detailed results can be found in Table 20 and Table 21 **Fehler! Verweisquelle konnte nicht gefunden werden..**

Scenario SP_MC_1: New Good-Morning-Service

6 out of 17 representatives of the service providers/monitoring centre group reported that they knew similar situations as described in the New Good-Morning-Service scenario, 3 were not sure and 8 did not know any similar situations. Participants' suggestions about possible use cases of AALuis in this context that might be helpful for their day-to-day business can be found in Table 22.

3 of the 17 participants reported that the scenario is rather not *realistic*, 1 was not sure, and 13 thought that it is a rather or definitely realistic scenario.

4 participants would (rather or definitely) not *add a feature like* the New Good-Morning-Service to their service offers, when it becomes available. Another 6 were not sure about it and 6 would (rather or definitely) add scenario-like features when available. 1 participant was not concerned with such a scenario or his/her organisation had already integrated something like shown in the scenario.

When the participants were asked whether the New Good-Morning-Service could *reduce expenses for their organisation*, answers were well distributed. Most of the participants agreed, that a scenario-like service would not reduce any costs for them. 1 participant/organisation is not concerned with it, 7 think that a service like shown in the scenario would not reduce any costs, 7 are unsure, and only 2 are rather sure about potential expense reductions.

When asking whether the *end user could benefit* from the New Good-Morning-Service opinions were consistent: 3 participants responded that they are not sure, but 14 service providers were rather or definitely sure about the benefits for the end user.

The participants were also asked to *rate the following characteristic* of the scenario on a 5-point semantic differential ranging from 1 to 5. The results can be found in Table 7.

<i>5-point semantic differential</i>	<i>mean ± sd</i>
<i>bad – good</i>	3.76 ± 1.25
<i>unwise – wise</i>	3.71 ± 1.21
<i>harmful – beneficial</i>	3.71 ± 1.21
<i>unpleasant – pleasant</i>	3.94 ± 0.75
<i>worthless – valuable</i>	3.41 ± 1.42
<i>joyless – enjoyable</i>	3.65 ± 1.54

Table 7 Mean and standard deviation of characteristics ratings on 5-point semantic differential

The service providers considered the New Good-Morning-Service to not make the *organisation of a monitoring centre easier*. 6 persons declined this statement, 6 were not sure, and 5 participants agreed to the statement that a scenario-like service would make the organisation of a monitoring centre easier.

When they were asked whether they think that the service as shown in the scenario was *too impersonal*, the opinions were rather consistent again. 11 out of 17 participants declined that the service was too impersonal, 6 were not sure.

4 participants were rather sure that a service like the New Good-Morning-Service could not *support their organisation*, 6 were unsure and 7 respondents were quite sure that such a service could help their organisation. We also asked the participants to *explain their answer* and to make *suggestions of improvement*. The detailed results can be found in Table 23 and Table 24.

Summary Service Providers/Monitoring Centres

Similar situations like in the Intervention Service scenario were known to the service providers/monitoring centres and they consider it widely as realistic. It is not sure whether the expenses could be reduced by the implementation of a scenario-like service. However, participants believe that the end users would benefit from such a service as well as it would make the organisation of a monitoring centre easier. The opinions about an avatar-based digital personal assistant differ. In general the service provider/monitoring centres have a rather positive attitude towards the Intervention Service scenario and think that the implementation of the service could support their organisation.

Situations like in the New Good-Morning-Service scenario were rather not known by the participants of service providers/monitoring centres. Nevertheless, they thought it is realistic and that they would think about adding scenario-like features to their service offers. When it comes to related costs the participants were rather undecided if it could reduce expenses for their organisations or not. According to the monitoring centres end users would definitely benefit from the New Good-Morning-Service and they don't fear that the scenario was too impersonal. However, the participants are undecided if the organisation of a monitoring centre would benefit as well and becomes easier. In general,

the scenario was perceived positive and the participants had the opinion that a service like the New Good-Morning-Service would support their organisation.

Critique came up concerning the replacement of humans by computers and one person was concerned that end users would not be supported with this scenario. Especially for small organisations it seems to be difficult to establish the necessary infrastructure because of financial and time constraints. It was also mentioned that most clients do not have Internet connections at home. However, the Intervention Service could be helpful regarding the development of services better meeting end user demands, the compensation of manpower shortage and an easy possibility of offering additional services (e.g. assisted living). Furthermore, the pressure on the employees making the right decision in critical situation and to help as fast as possible could be reduced.

The participants commented that AALuis could establish a new communication modality with the clients. Other mentioned advantages include that the personnel could be employed more directly and more attractive service offers could be provided to the client. Scenarios like the presented ones could attract younger clients and the monitoring centres could care for more clients.

4.1.2.3 Service Providers/Caregivers

46 of the 106 participants classified themselves as caregivers and had a look at the accordant scenarios.

Scenario SP_CG_2: Medication Reminder Service

33 out of 46 representatives of the caregivers reported that they knew similar situations as described in the Medication Reminder Service scenario, 3 were not sure and 10 did not know any similar situations. Participants' suggestions about possible use cases of AALuis in this context that might be helpful for their day-to-day business can be found in Table 25. 6 of the 46 participants reported that the scenario is rather not *realistic*, 1 was not sure, and 39 thought that it is a rather or definitely realistic scenario.

8 participants would (rather or definitely) not *add a feature like* the Medication Reminder Service to their service offers when it becomes available. 7 were not sure about it and 27 would (rather or definitely) offer scenario-like features when available. 5 participants were not concerned with such a scenario or his/her organisation had already integrated something like shown in the scenario.

We asked the participants whether the Medication Reminder Service could *reduce expenses for their organisation*. Most of the participants (22/45) disagreed, 10 were unsure and 12 could imagine a cost-reduction. 1 participant/organisation is not concerned with it.

When asking whether the *end user could benefit* from the Medication Reminder Service opinions were rather consistent: 2 participants responded that they are not sure, 6 reported that it might not be helpful, but 38 caregiver were rather or definitely sure about the benefits for the end user.

The participants were also asked to *rate the following characteristic* of the scenario on a 5-point semantic differential ranging from 1 to 5. The results can be found in Table 8.

<i>5-point semantic differential</i>	<i>mean ± sd</i>
<i>bad – good</i>	3.39 ± 1.64
<i>unwise – wise</i>	3.48 ± 1.67
<i>harmful – beneficial</i>	3.74 ± 1.51
<i>unpleasant – pleasant</i>	3.37 ± 1.60
<i>worthless – valuable</i>	3.33 ± 1.61
<i>joyless – enjoyable</i>	3.02 ± 1.63

Table 8 Mean and standard deviation of characteristics ratings on 5-point semantic differential for the Medication Reminder Service scenario.

The caregivers were rather sceptical that the Medication Reminder Service would make the *organisation of a care organisation easier*. 19 persons don't think so, 13 were not sure, and 13 participants could imagine that a scenario-like service makes the management of their organisation easier.

11 participants were sure that a service like the Medication Reminder Service could not *support their organisation*, 7 were unsure and 27 respondents were quite sure that such a service could help their organisation. We also asked the participants to *explain their answer* and to make *suggestions of improvement*. The detailed results can be found in Table 26 and Table 27.

Scenario SP_CG 1: Health Monitoring Service

22 out of 39 representatives of the caregivers reported that they knew similar situations as described in the Health Monitoring Service scenario, 5 were not sure and 12 did not know any similar situations. Participants' suggestions about possible use cases of AALuis in this context that might be helpful for their day-to-day business can be found in Table 28.

6 of the 39 participants reported that the scenario is rather not *realistic*, 1 was not sure, and 32 thought that it is a rather or definitely realistic scenario.

9 participants would (rather or definitely) not *add a feature like the Health Monitoring Service* to their service offers, when it becomes available. Another 6 were not sure about it and 22 would (rather or definitely) add scenario-like features when available. 2 participants were not concerned with such a scenario or his/her organisation had already integrated something like shown in the scenario.

We asked the participants whether the Health Monitoring Service could *reduce expenses for their organisation*. 9 participants disagreed, 5 were unsure and 15 could imagine a possible cost-reduction. 1 participant/organisation is not concerned with it.

When asking whether the *end user could benefit* from the Health Monitoring Service opinions pointed clearly in a positive direction: only 4 participants don't think so, 5 participants responded that they are not sure, and 30 caregiver were rather or definitely sure about the benefits of a scenario-like service for end users.

The participants were also asked to *rate the following characteristics* of the scenario on a 5-point semantic differential ranging from 1 to 5. The results can be found in Table 9.

<i>5-point semantic differential</i>	<i>mean ± sd</i>
<i>bad – good</i>	3.45 ± 1.77
<i>unwise – wise</i>	3.58 ± 1.65
<i>harmful – beneficial</i>	3.63 ± 1.53
<i>unpleasant – pleasant</i>	3.38 ± 1.50
<i>worthless – valuable</i>	3.45 ± 1.72
<i>joyless – enjoyable</i>	3.25 ± 1.71

Table 9 Mean and standard deviation of characteristics ratings on 5-point semantic differential for the Health Monitoring Service scenario.

The caregivers rather believe that the Health Monitoring Service would make the *organisation of a care organisation easier*. 20 persons agreed to this statement, 4 were not sure, and 15 participants don't think that a scenario-like service would make the organisation of a care organisation easier.

The survey also showed that clients will need help with the measurement of physical parameters when using the monitoring service: 3 were convinced that their clients will not need help, but 28 indicated that they definitely would need help, 8 were unsure about it.

8 participants were sure that a service like the Health Monitoring Service could not *support their organisation*, 8 were unsure and 22 respondents were quite sure that such a service could help their organisation. One participant claimed that his/her organisation is not concerned with this or has already integrated a scenario-like service. We also asked the participants to *explain their answer* and to make *suggestions of improvement*. The detailed results can be found in Table 29 and Table 30.

Summary Service Providers/Caregivers

Similar situations like in the Medication Reminder Service scenario were known to the caregivers and they consider it widely realistic. End user would probably benefit from services presented in this scenario. The majority of the participants stated that they would implement a scenario-like feature if available. On the other hand they fear that the expenses could rather not be reduced by the implementation of a scenario-like service. Besides, the Medication Reminder Service would rather not make the organisation of a monitoring centre easier. Overall the scenario was perceived positive and helpful to the care organisation itself.

The most suggestions concerning additional use cases of the Medication Reminder Service scenario were related to extending the reminder service to other fields. It was also mentioned that a care service just relying on medication reminders would not be sufficient for people with dementia. A very important aspect is to support the individual daily routine of every older adult. Usually, older adults don't want to adapt to changes but in cases of increasing dementia they tend to forget basic aspects and get confused. So AALuis should support them. It would be good to not only remind of medication but also of appointments, birthdays or favourite TV shows as well as basic activities like organizing the day, getting up, drinking and eating. One participant wrote as an example that some patients want to prepare breakfast after having an afternoon nap. The integration of further supportive

technology into one user interface is mentioned as well to also control washing machine, jalousies or robotic vacuum cleaner.

Especially in cases of mild to moderate dementia for being aware of wandering behaviour a (GPS-) tracking tool for the patient could be helpful. Monitoring of weight, blood pressure and heart frequency would be beneficial as well. An additional sensor system for detecting falls or other emergencies and informing responsible care personal is mentioned as well. It would be good to bundle all communication within one device (e.g. Tablet or TV). Giving older adults the opportunity to leave a message when going out to inform relatives and/or caregivers about aims and estimated time of return. In case of significant delays caregivers could be informed. Another suggestion in this area is the offering and organisation of driving services.

Furthermore, supporting social activities for patients would be beneficial to slow down the mental decline e.g. playing online games with other older persons or relatives. Offer services just for talking was suggested as many older adults live alone and are lonely. Speech-based interactions for older adults are appreciated also from the stakeholders' point of view.

Participants who believe that the Medication Reminder Service scenario does not support their organisation do mainly deal with customers that need more support than medication reminders. Medication for people with dementia needs to be prepared by professionals. Besides, there is no control in this scenario if the medication has been taken. One participant meant that a holistic view at the problems is missing. Other mentioned aspects: there are already reminder services available and one participant uttered the fear that due to AALuis the budget of care organisations could be cut down.

Optimistic participants emphasized the advantage that older adults can remain living independently at home even with slight signs of dementia. Furthermore, care organisations can control medication over distance and some visits can be avoided in order to save money. Further advantages include tranquilised relatives, lesser complications caused by forgotten medication, increasing amount of customers and less stress for the caregivers. Some statements also refer to necessary conditions for bringing this service to success. One participant answered that it can just work on a volunteer basis and another one pointed out that it needs to be cheap. The scenario describes a new service that could not only be interesting for existing customers but also for gaining new customers as it supports mainly people who do not need care, yet. By this means, sales can increase and new business models can be developed. One participant even wrote that it could be a free service when delivered in a bundle with others.

The Health Monitoring Service scenario was perceived as realistic and well known and the majority would add scenario-like features. Additionally the participants rated the features as potentially reducing the organisations' costs and as helpful for the end user. The survey also showed that clients will need help with the measurement of physical parameters when using the monitoring service. The overall opinion was positive and the service was considered to be helpful for caregivers.

As suggestions for further use cases in relation to the Health Monitoring Service scenario some participants named other values that could be monitored with the help of this service: blood sugar, blood pressure, weight, amount of meals, physical and mental exercises. In general, a holistic view at all wellbeing factors of older adults is necessary. Not only bodily but also mental and social aspects are very important. And so are real visits of caregivers. They may not be abandoned. Furthermore, customers should not only measure their vital signs and receive reminders they could also receive tips for healthy

alimentation or activities (These participants did not see the Intervention Service). One participant suggested including a game-like approach to motivate older people to live in a healthier way. A general electronic health record is highly appreciated. However, for a general database of vital signs used by doctors and caregivers it is important to include many doctors at an early stage (ELGA problem).

Participants who consider the Health Monitoring Service helpful emphasized especially the benefits for their associates: to reduce travel stress and to concentrate on important visits. But also the development of new business models seems to be possible. There are strategic advantages as more patients could be cared for. This additional service also has potential to attract new customers. Another mentioned advantage is that a more frequent and cheaper monitoring of concerned patients could be realised. Besides, the autonomy of patients remains higher by taking measures themselves. As measurements can be taken more often a faster detection of problems is possible. The creation of a general electronic health record is appreciated by several participants as well. Communication between caregivers, doctors, hospitals and health insurance could improve.

Sceptical participants focus mainly on the aspect that a doctor is required for intervening in critical situation; a caregiver doesn't have the appropriate formation. One participant raised the question of privacy and security: how can data be protected, who is responsible for measurement errors and what happens at a system failure? Another participant is afraid that patients would be overstrained.

4.1.2.4 Developer

42 of the 106 participants classified themselves as developers and had a look at the accordant scenarios.

Scenario SP_DEV 1: Brian, Service Developer

28 out of 42 representatives of the developers reported that they knew similar situations as described in the Service Developer scenario, 2 were not sure and 12 did not know any similar situations. Participants' suggestions about possible use cases of AALuis in this context that might be helpful for their day-to-day business can be found in Table 31 **Fehler! Verweisquelle konnte nicht gefunden werden..**

6 of the 42 participants reported that the scenario is rather not *realistic*, 2 were not sure, and 34 thought that it is a rather or definitely realistic scenario.

We asked the participants whether the AALuis middleware could *reduce expenses for their organisation*. 11 of the participants disagreed that the implementation of a scenario-like service could reduce any costs for them while 31 could imagine a possible cost-reduction.

When asking whether the *end user could (indirectly) benefit* from the AALuis middleware as mentioned in the scenario opinions pointed clearly in a positive direction: only 4 participants don't think so, 2 participants responded that they are not sure, and 36 developer were rather or definitely sure about the benefits of the AALuis middleware for the end user.

The participants were also asked to *rate the following characteristics* of the scenario on a 5-point semantic differential ranging from 1 to 5. The results can be found in Table 10.

<i>5-point semantic differential</i>	<i>mean ± sd</i>
<i>bad – good</i>	4.10 ± 0.85
<i>unwise – wise</i>	3.74 ± 1.19
<i>harmful – beneficial</i>	3.95 ± 1.15
<i>unpleasant – pleasant</i>	3.60 ± 1.08
<i>worthless – valuable</i>	4.05 ± 0.88
<i>joyless – enjoyable</i>	3.45 ± 0.94

Table 10 Mean and standard deviation of characteristics ratings on 5-point semantic differential for the Service Developer scenario.

7 developers indicate that they would not make use of the AALuis middleware when it comes available, 14 are not sure and 19 tend to use it as soon as it is available. 1 participant is not concerned with this decision.

7 participants were sure that the AALuis middleware as described in the scenario could not *support their organisation*, 10 were unsure and 24 respondents were quite sure that the middleware could help their organisation. We also asked the participants to *explain their answer* and to make *suggestions of improvement*. The detailed results can be found in Table 32 and Table 33.

Scenario UI DEV 2: Albert, UI Developer

19 out of 35 representatives of the developers reported that they knew similar situations as described in the UI Developer scenario, 4 were not sure and 12 did not know any similar situations. Participants' suggestions about possible use cases of AALuis in this context that might be helpful for their day-to-day business can be found in Table 34.

2 of the 35 participants reported that the scenario is rather not *realistic*, 4 were not sure, and 29 thought that it is a rather or definitely realistic scenario.

We asked the participants whether the AALuis middleware could *reduce expenses for their organisation*. 2 participants don't expect that using the AALuis Middleware reduces any costs for them, and 27 could imagine a possible cost-reduction. 6 were unsure.

When asking whether the *end user could (indirectly) benefit* from the AALuis middleware as mentioned in the scenario, opinions pointed in a positive direction: only 2 don't think so, 1 participant responded that he/she is not sure, and 32 developer were rather or definitely sure about the benefits of the AALuis middleware for end users.

The participants were also asked to *rate the following characteristics* of the scenario on a 5-point semantic differential ranging from 1 to 5. The results can be found in Table 11.

<i>5-point semantic differential</i>	<i>mean ± sd</i>
<i>bad – good</i>	4.29 ± 0.79
<i>unwise – wise</i>	3.97 ± 0.79
<i>harmful – beneficial</i>	4.23 ± 1.03

<i>unpleasant – pleasant</i>	3.91 ± 0.89
<i>worthless – valuable</i>	4.29 ± 0.89
<i>joyless - enjoyable</i>	3.71 ± 0.86

Table 11 Mean and standard deviation of characteristics ratings on 5-point semantic differential for the UI Developer scenario.

5 developers indicated that they would not make use of the AALuis middleware when it comes available, 9 are not sure and 19 tend to use it as soon as it is available. 2 participants are not concerned with this decision.

6 participants were sure that the AALuis middleware as described in the scenario could not *support their organisation*, 10 were unsure and 19 respondents were quite sure that the middleware could help their organisation. We also asked the participants to *explain their answer* and to make *suggestions of improvement*. The detailed results can be found in Table 35 and Table 36.

Developer-specific questions

In contrast to the other two stakeholder groups we decided to ask the developers three more open questions related to usually used key technologies (see Table 37), characteristics and features of AALuis (see Table 38) and about the needs for AALuis to make it a long-lasting successful project (see Table 39).

Summary Developer

Similar situations like in the "Brian, Service Developer" scenario were known to the developers and consider it as rather or definitely realistic. Also about three quarters of the developers imagine that AALuis could help reduce the expenses in their organisation. Almost all developers regarded AALuis as beneficial to their end users.

Only half of the developers found their organisation supported and could imagine the adaption of the AALuis middleware. The rest were unsure of the usage and a minority ruled the usage completely out. Almost a quarter of the participating developers thought their organisation was not supported at all. The reasoning behind this was in the most cases that proprietary solutions existed in the organisation. Developers stated that the AALuis middleware, as described in the scenario, would not lend itself to adoption or that they are not having the user interface as their main concern. Others found that the AALuis middleware could indeed reduce efforts for the creation of user interfaces. They see the benefit of reduced development effort.

Suggestions of possible use cases were centred more on the service side than on use cases that concern developers. These service suggestions circle mostly around the organisation of the daily routines and the monitoring and track keeping of them. Additionally alarming services were mentioned.

A migration scenario, from existing services to AALuis-based services was one of the mentioned developer use cases. This can be considered in the formation of the AALuis open source process, and could be part for the documentation of AALuis.

Another scenario raised awareness to the issue of catering the user interface to different devices and the additional effort and difficulty to do so. This is considered one of the

concerns of the AALuis transformation process, and the mitigation of the mentioned hurdles as covered.

The scenario "UI Developer" was declared as unknown to a third of the participants of the questionnaire. The rest stated they knew similar situations. Still a large majority of the developers considered the scenario rather or definitely realistic, and that the adaption of AALuis in the described way would reduce expenses. Only ten per cent of the respondents answered that they could not see a benefit to the end user. Half of the group answering the questionnaire stated they could imagine using the AALuis middleware in their organisation. The same amount sees their organisation supported. The main reasons for not adopting AALuis are pre-existing solutions in the AAL domain. On the other hand integration in existing solutions or platform concepts is regarded as the main way to the adaption of AALuis.

Similar to the other developer scenario, suggestions for additional use-cases centred on services and not necessarily on developer use cases. The compensation of different impairments through AALuis was most often mentioned basis for use-case considerations (E.g. people with dementia, blind or bad eyesight, or users with hearing impairments.).

The open question about the key technologies used in the developers' organisation revealed the following: The most commonly mentioned technology was the JAVA VM. Many of the developers use the JAVA technology in one of the two ways: The JAVA programming language either as is or on the Android platform. Android was also the most commonly mentioned smart-phone and tablet framework. Another common theme among answers was internet based technologies like HTML, XML, Flash, AJAX or PHP. The universAAL middleware was the only AAL-middleware to be found in the answers.

The opinions on characteristics and features of the AALuis middleware that facilitate developer adoption were widespread: The support of different input technologies was mentioned several times as an important factor. The adoption of input methods that do not rely on keyboard and mouse was underlined. Alternatives such as speech input, the TV remote control, or touchscreen based devices were mentioned. Also supporting tools and materials were considered essential.

To make AALuis a long lasting and widely used open source project, a critical mass in real usage was considered to be important by the developers. This takes shape in the mentioning of real applications and real users. Also a real open source process was mentioned, with online support, an online user and developer forums etc.

4.1.2.5 AALuis in General

In the end of the survey we asked all participants about their general attitude towards AALuis.

When we asked the participants whether AALuis could be of use for their organisation 11 of the 86 participants disagreed, 23 were unsure and 52 agreed to this statement.

21 participants declined the statement that AALuis would make their day-to-day business easier: 24 were unsure and 41 were sure about it.

14 participants claimed that their organisations could not benefit from AALuis, 22 were not sure, and 50 were definitely sure about their organisations' benefit from AALuis. In Table 40 and Table 41 suggestions can be found of how the participants' organisations could benefit from AALuis as described in the scenarios or what should be changed to make AALuis helpful.

We asked every participant which additional services they can think of that might be helpful for either the end user or their organisation. The detailed results can be found in Table 42.

The participants were also asked to rank the most important challenges standing in the way to successfully introduce AALuis to their organisation. The given challenges were ranked as follows:

- 1 Financial boundaries (reimbursement) and End user
- 2 Technical integration
- 3 Implementing/ adjusting internal protocols for AALuis
- 4 Cultural issues

Summary

In General the concept and the aims of AALuis are appreciated and welcomed. Stakeholders think they could benefit from AALuis and that their day-to-day business could be eased. Especially time and cost efficiency and the consequences are mentioned as big advantages of AALuis. It would be cost-efficient for the national health care systems and time-efficient in terms of less organisational efforts. However, there is quit a big number of stakeholders who is unsure about the saving costs.

Consequences of AALuis-based services might be that UIs are easily adaptable to any device, services might be provided with more intense and more target-oriented. An advantage would also be the extra time that is provided for intense social and personal contact between client and caregiver. The permanent presence of service providing or care organisations by giving information on recent offers to the clients through AALuis, as well as the standardized automated processes are also considered advantageous. The services could be easily distributed and a more attractive offer could be provided. The free middleware facilitates the development of new services in terms of creating and adjusting UIs towards a higher accessibility.

Reasons why AALuis would not benefit the participants' organisation are mostly reduced to the fact that the shown scenarios do not match the organisations' exact field of activity. Other reasons are reformulated in the following paragraph on suggestions for the improvement of AALuis. Answers on suggestions for improvement or additional services of AALuis can be clustered into 5 dimensions: data collection and analysis, adaptability and interaction, quality assessment and feedback, development and suggestions for additional services.

Comments on *data collection and analysis* include health risk management, trend analysis, a well-being diary for self-monitoring to send to professionals, fall detection and activity monitoring, as well as automated adaption and support with the evolution of an AALuis system with increasing age (and impairment).

Adaptability and interaction. Multimodal interaction was mentioned to be important for the user as well as raising the target group specific usability. Therefore the configuration settings should be rich and AALuis should consider media- and technological convergence.

Quality assessment and feedback: The user should have the opportunity to give feedback on the system. Technical support and updates need to be provided as well. Guidelines for developers of AALuis-based apps should be provided to assure quality, as well as AALuis should provide generic test cases and simulators.

Design and development: The graphic design should be platform-independent so each interface has to be designed only once to be deployed on different devices (e.g. for Androids or iOS, etc.). A framework (visual development tool) should be provided to ease the development of UIs.

Additional services like a calendar, nutritional services including shopping lists or even shopping services, local food services (e.g. bakery, meals), medication services, reminder services (e.g. medication, exercise, drink, feed pet) and the control of proper working (measurement-) devices, the inclusion of (cognitive) games, as well as exercise tracking and fall detection have been suggested. Dementia requires additional services like localisation app or the integration of fall detection sensors. Consulting with buying assistive tools should be provided. AALuis should be applied to different languages and to different diets and an AALuis community should be established with a blog.

4.2 Summary and Implications for AALuis

In this section the results of the stakeholder requirements are summarized. Corresponding implications are elicited and numbered by a unique identifier to refer to a certain stakeholder requirement (prefix 'S' followed by a dash ('-') and a digit for the requirement (e.g. S-01)).

General

Overall the scenarios were seen quite positive especially in terms of demonstrating realistic situations and concerning potential benefits for end users. With regard to saving expenses and easing the organisation just half of the participants believe in advantages by AALuis. Interestingly the stakeholder group of developers was the most positive for all scenarios including reduction of costs and organisational overhead. Apart from the developer scenarios the Health Monitoring Service received the best grades.

- Other mentioned positive aspects were the additional business opportunities e.g. to attract younger clients and raise capacities.
→ S-01 New target groups for exploitation should be addressed.
- Mentioned advantages for the caregivers included less travel stress and less pressure in critical situations.
→ S-02 These advantages need to be presented and leveraged.
- A critical mass of usage is assumption for adapting to AALuis and some organisations need support in establishing the required infrastructure.
→ S-03 Promotion activities especially in the beginning necessary.
→ S-04 Provide support for the organisations with adapting to AALuis.

Caregivers and monitoring centres

To overcome mentioned problems the following concerns and implications should be regarded:

- The services are not eligible for people with dementia
→ S-05 The use cases should aim at more concrete target groups.
→ S-06 In addition to medication reminders could also be available for appointments and activities
→ S-07 It would be helpful to control if and which medicine has been taken.
→ S-08 Dementia requires additional services like a localisation app or the integration of fall detection sensors.

- The diversity of elderlies concerning physical and mental impairments is very high. Thus specific usability and accessibility issues need to be handled.
 - S-09 Configuration settings should be rich.
 - S-10 Support a high amount of different input and output modalities.
 - S-11 Provide convergent services and user interfaces to ease change of input/output modality when necessary.
- A holistic view on wellbeing factors becomes possible with the help of an Electronic Health Record (EHC) and the monitored data. Although this is mainly related to specific services this means for AALuis:
 - S-12 Service developers: Support better communication between different caregivers, relatives and doctors.
 - S-13 Service developers: Existing EHC solutions should be picked up.
 - S-14 Security and privacy issues need to be taken into account.

Developers

- The main concern of the developers was the usage of proprietary solutions in their companies. So the consortium has to point out specifically that AALuis is a middleware layer that can be used together with existing middleware.
 - S-15 Provide a tutorial on how existing services can be migrated to the AALuis architecture.
 - S-16 Provide service guidelines for service developers and UI guidelines for UI developers of AALuis-based services to assure quality.
 - S-17 Include generic test cases and simulators to AALuis.
 - S-18 Provide a framework (visual development tool) to ease development.

5 Technical Requirements

The technical requirements of the AALuis system are based on the end-user and the stakeholder requirements as well as the use cases and scenarios. They are split into two different categories:

- functional requirements (prefix 'F' or 'NEW'), and
- non-functional requirements (prefix 'N').

A unique identifier is used to refer to a certain technical requirement. It is the appropriate prefix ('F', 'NEW', or 'N') followed by a dash ('-'), digit for the category, a dot ('.') and a digit for the requirement (e.g. F-01.10). Requirements with the prefix 'NEW' were collected without assigning them to a category because most of them affect more than one component. The description is the most important column in the table. It describes in a narrative way the nature of the requirement. The priority marks the importance of the requirement. Valid entries are: 'High', 'Medium', and 'Low'.

Requirements defined for the second prototype are identified using 'NEW' as identifier. They are primarily based on the results from the lab trial evaluation results and further new service requirements.

In Table 12 and Table 13 one can find all collected technical requirements with source (e.g. DoW, End User Requirements, Stakeholder Requirements, UI developer, Service developer, Layer developer) and priority.

5.1 Functional requirements

<i>Identifier</i>	<i>Description</i>	<i>Source</i>	<i>Priority</i>
<i>F-01</i>	<i>User Interface Layer</i>		
<i>F-01.10</i>	Devices are integrated and discovered by the AALuis Layer through the implementation of device connectors using UPnP.	UI Dev.	High
<i>F-01.20</i>	On device side device adapters connect to the AALuis layer via UPnP.	UI Dev.	High
<i>F-01.30</i>	AALuis services should provide a service control interface that allows initialization and access to the task, binding and content descriptions.	Service Dev.	High
<i>F-01.40</i>	Task, binding and content descriptions should be based on XML structures and will map to corresponding Java structures (interfaces and classes).	Service Dev.	High
<i>F-01.50</i>	AALuis services should provide a service user interface for the execution of service task methods.	Service Dev.	High
<i>F-01.60</i>	AALuis services can be implemented as OSGi bundles.	Layer Dev.	High
<i>F-01.70</i>	AALuis services can be bound to external AAL web services.	Service Dev.	Medium
<i>F-01.80</i>	AALuis services can be bound to universAAL services.	DoW	Low
<i>NEW-01</i>	Multi-user support: multiple users can work with a single service instance.	Service Dev.	High
<i>NEW-02</i>	It must be optionally possible to link an 'alert' notification to an	Service	Low

	interaction session (closely related to NEW-01).	Dev.	
<i>NEW-04</i>	Distinguish between navigation, action and option controls.	Lab Trials	High
<i>NEW-05</i>	Get rid of unique identifiers in the CTT creation step.	Service Dev.	Low
<i>NEW-08</i>	Introduce the new modality "application/id".	Service Dev.	High
<i>NEW-10</i>	Presentation set titles in CTT.	Lab Trials	High
<i>NEW-12</i>	Context change trigger from layer to service.	Service Dev.	High
<i>NEW-22</i>	An additional back-button (always one step back): Users should have the feeling that they cannot make any mistakes, because any action can be cancelled.	Lab Trials	Medium
<i>F-02</i>	<i>Innovative User Interfaces</i>		
<i>F-02.10</i>	The UIs should be usable with TVs	E-01, E-04, E-11, E-14	High
<i>F-02.11</i>	The UIs should be usable with Touch Table Devices	E-18	High
<i>F-02.12</i>	The UIs should be usable with Mobile Devices	E-13, E-18	High
<i>F-02.20</i>	The user interface should support Text Output Modality	DoW	High
<i>F-02.21</i>	The user interface should support Image Output Modality	DoW	Medium
<i>F-02.22</i>	The user interface should support Audio (Speech) Output Modality	DoW, E-17	High
<i>F-02.23</i>	The user interface should support Avatar Output Modality	DoW	High
<i>F-02.30</i>	Input modalities for the TV should be supported.	S-10	High
<i>F-02.31</i>	Touch based Input modalities should be supported	E-18	High
<i>F-02.32</i>	Speech Input should be an input modality	E-17	Medium
<i>F-02.40</i>	Users can change the user interface at any time during the usage of a service.	UI Dev.	Low
<i>F-02.41</i>	The AALuis Layer is responsible to cater the UI to the new device.	UI Dev.	High
<i>F-02.42</i>	Known input will not be lost during a change of device.	UI Dev.	High
<i>F-02.50</i>	Device's native notification services should be supported.	UI Dev.	Low
<i>F-02.60</i>	The user interfaces will adapt to the preferred input modalities of the user.	DoW	High
<i>F-02.70</i>	The user interfaces will provide multimodal output for optimal information transmission	DoW	High
<i>F-02.80</i>	The output will be enhanced by modalities that are not provided by the service directly, i.e. audio speech and/or talking face information will be automatically generated and delivered synchronously when not present in the original content of the	UI Dev.	Medium

	service request.		
<i>F-02.90</i>	The available input and output modalities should be adapted to the various type of context (user, task and environment).	DoW	High
<i>F-02.100</i>	The “conversion matrix” will be designed in such a way, that later addition is possible. (E.g. through a plug-in mechanism)	Layer Dev. F-02.80	Medium
<i>F-02.110</i>	Rich configuration options of the UI should be possible.	S-09	Medium
<i>F-02.120</i>	The UI can be split and distributed over multiple I/O devices (e.g. the TV shows the avatar and an OK-button is displayed on the smartphone)	UI Dev.	Low
<i>NEW-07</i>	Automatic hiding of empty dropdown-boxes.	Lab Trials	Low
<i>NEW-11</i>	UI support for 'radiobuttons' (pick one item from a list but not with a dropdown box).	Service Dev.	Medium
<i>NEW-15</i>	For every device an individual UI template should be used to benefit of the specific advantage of a device (e.g. big vs. small screen / touch vs. mouse vs. remote control).	Lab Trials	High
<i>NEW-16</i>	Arrow icons at screen and arrow buttons at the remote control should look more similar.	Lab Trials	Medium
<i>NEW-17</i>	Most of the main content should be visible without scrolling (buttons need to much space).	Lab Trials	Medium
<i>NEW-19a</i>	Place the buttons “Nachricht absenden” at the bottom of the Write Message Screen to send a new message.	Lab Trials	Medium
<i>NEW-19b</i>	Put the button “Nachricht beantworten” at the bottom of the Message Detail Screen when a quick answer should is expected.	Lab Trials	Medium
<i>NEW-26</i>	A dedicated appointment details view should not be necessary. By navigating through the various care appointments on the left the whole information about the appointment including all relevant details should be visible immediately.	Lab Trials	High
<i>NEW-28</i>	Use a more obvious visual highlighting of the current UI element which has the focus.	Lab Trials	High
<i>NEW-29</i>	The template of the tablet should also be used for the reminder-popups at TV (see mock-ups) because then all information is visible immediately.	UI Dev.	High
<i>NEW-35</i>	When scrolled down the navigation buttons at the top should remain visible all the time.	UI Dev.	Medium
<i>F-03</i>	<i>Service Applications</i>		
<i>F-03.10</i>	Services for the first prototype should look familiar to the users. (E.g. By using the service providers corporate identity, Logo)	E-01	High
<i>F-03.20</i>	Services should be adequate for different types of input modalities.	S-11	High
<i>F-03.30</i>	Services send additionally to task descriptions, a content document. This means that a task can define, per step, additional output types (E.g. long text, short text, audio stream, or pictures). These will be used with a higher priority by the	Layer Dev.	Medium

	AALuis Layer than self-generated content.		
<i>F-03.40</i>	Services can optionally contain a preferred Template. When the preference is missing, a default Template will be used. A Template is the facility for “branding” a final User Interface by a Service.	Layer Dev.	Low
<i>F-03.50</i>	The User Input will be sent through the AALuis Layer to the Service through middleware facilities. It will be annotated in a way that it can be clearly and easily attributed to a user, a service, a task, a step, etc.	Layer Dev.	Low
<i>NEW-18</i>	Change the order of messages and put the latest message on top.	Lab Trials	Medium
<i>NEW-20</i>	Use easily recognizable UI components (e.g. a pop up or drop down list) with a list of all courses instead of an extra screen with the courses list after pressing the button “Nachricht schreiben”.	Lab Trials	High
<i>F-04</i>	<i>Cross-sectional Requirements</i>		
<i>F-04.10</i>	Implement generic test cases.	S-17	Low
<i>F-04.20</i>	Implement a simulator.	S-17	Low
<i>F-04.30</i>	Visual development tools should be available for development.	S-18	Low
<i>F-05</i>	<i>Documentation & Distribution</i>		
<i>F-05.10</i>	A development wiki/tutorial should introduce how to describe the capabilities of devices, user interfaces, and services, as well as how to integrate them into the AALuis Layer.	S-15, S-16	High
<i>F-05.20</i>	Instruction manuals for services should be provided printed or possibly on digital paper.	E-15	Medium
<i>F-05.30</i>	Instruction manuals for the AALuis functionalities should be provided printed or possibly on digital paper.	E-15	Medium
<i>F-05.40</i>	Samples for Service development should be downloadable from the AALuis homepage.	DoW	Medium
<i>F-05.50</i>	Samples for I/O device development should be downloadable from the AALuis homepage.	DoW	Medium
<i>F-05.60</i>	Samples for User Interaction development should be downloadable from the AALuis homepage.	DoW	Medium

Table 12 List of functional technical requirements

5.2 Non-functional requirements

<i>Identifier</i>	<i>Description</i>	<i>Source</i>	<i>Priority</i>
<i>N-01</i>	<i>Human-Computer Interaction</i>		
<i>N-01.10</i>	UI should be integrated in present technologies in the home (e.g. TV, PC, mobile devices), especially in the TV.	E-01, E-11	High
<i>N-02</i>	<i>Miscellaneous</i>		

<i>N-02.10</i>	Results of the AALuis Layer development should be released to the public domain (Open Source).	DoW	High
<i>N-02.20</i>	The system should be secure. The protection of personal data is a major issue.	E-07	High
<i>N-02.30</i>	Service integration should be plug-and-play.	Service Dev.	High
<i>N-02.40</i>	The system should be extendable and adoptable.	DoW	Medium

Table 13 List of non-functional technical requirements

5.3 Requirements Status

The following table gives an overview of all requirements after the second requirements phase. The status flag of a requirement is be set to: 'Open', 'Specified', 'Implemented', or 'Discarded'. In case of 'Discarded' as status a reason is given (Table 14).

Most of the requirements have been defined, specified and implemented in the first iteration for the first prototype used in the lab trials. Some further requirements have been added in the second iteration after the lab trials. Please be aware that the specification and implementation cannot by fully covered within this research project. Therefore, some requirements will not be considered for the final AALuis prototype (remain 'Open' or 'Specified'). However, these requirements are not critical for the field trials and should be considered for further exploitation of the project results.

<i>Identifier</i>	<i>Priority</i>	<i>Status</i>		<i>Identifier</i>	<i>Priority</i>	<i>Status</i>
<i>F-01</i>	<i>User Interface Layer</i>					
<i>F-01.10</i>	High	Implemented		<i>NEW-01</i>	High	Open
<i>F-01.20</i>	High	Implemented		<i>NEW-02</i>	Low	Open
<i>F-01.30</i>	High	Open		<i>NEW-04</i>	High	Open
<i>F-01.40</i>	High	Implemented		<i>NEW-05</i>	Low	Open
<i>F-01.50</i>	High	Implemented		<i>NEW-08</i>	High	Open
<i>F-01.60</i>	High	Implemented		<i>NEW-10</i>	High	Open
<i>F-01.70</i>	Medium	Implemented		<i>NEW-12</i>	High	Open
<i>F-01.80</i>	Low	Open		<i>NEW-22</i>	Medium	Open
<i>F-02</i>	<i>Innovative User Interfaces</i>					
<i>F-02.10</i>	High	Implemented		<i>F-02.80</i>	Medium	Specified
<i>F-02.11</i>	High	Implemented		<i>F-02.90</i>	High	Implemented
<i>F-02.12</i>	High	Implemented		<i>F-02.100</i>	Medium	Open
<i>F-02.20</i>	High	Implemented		<i>F-02.110</i>	Medium	Implemented
<i>F-02.21</i>	Medium	Open		<i>F-02.120</i>	Low	Open
<i>F-02.22</i>	High	Open		<i>NEW-07</i>	Low	Open
<i>F-02.23</i>	High	Open		<i>NEW-11</i>	Medium	Open
<i>F-02.30</i>	High	Implemented		<i>NEW-15</i>	High	Open
<i>F-02.31</i>	High	Implemented		<i>NEW-16</i>	Medium	Open
<i>F-02.32</i>	Medium	Specified		<i>NEW-17</i>	Medium	Open
<i>F-02.40</i>	Low	Implemented		<i>NEW-19a</i>	Medium	Open
<i>F-02.41</i>	High	Implemented		<i>NEW-19b</i>	Medium	Open
<i>F-02.42</i>	High	Implemented		<i>NEW-26</i>	High	Open
<i>F-02.50</i>	Low	Open		<i>NEW-28</i>	High	Open

<i>F-02.60</i>	High	Implemented		<i>NEW-29</i>	High	Open
<i>F-02.70</i>	High	Discarded ⁷		<i>NEW-35</i>	Medium	Open
<i>F-03</i>	<i>Service Applications</i>					
<i>F-03.10</i>	Medium	Specified		<i>F-03.50</i>	Low	Implemented
<i>F-03.20</i>	High	Specified		<i>NEW-18</i>	Medium	Open
<i>F-03.30</i>	Medium	Specified		<i>NEW-20</i>	High	Open
<i>F-03.40</i>	Low	Specified		<i>NEW-21</i>	Low	Open
<i>F-04</i>	<i>Cross-sectional Requirements</i>					
<i>F-04.10</i>	Low	Implemented		<i>F-04.30</i>	Low	Discarded ⁸
<i>F-04.20</i>	Low	Discarded ⁹				
<i>F-05</i>	<i>Documentation & Distribution</i>					
<i>F-05.10</i>	High	Open		<i>F-05.40</i>	Medium	Open
<i>F-05.20</i>	Medium	Open		<i>F-05.50</i>	Medium	Open
<i>F-05.30</i>	Medium	Open		<i>F-05.60</i>	Medium	Open

Table 14: Status of requirements

⁷ Already specified by F-02.21 to F-02.23.

⁸ CTTe, MARIAe tools are available for visual CTT modelling. In case of exploitation of the research results improvements of the tools or some new implementation should be provided.

⁹ The existing CTTe simulator (part of MARIAe) can be used.

6 Trial Requirements

The trials of AALuis to be conducted in WP6 consist of three parts: formative usability tests, lab trials and field trials. As the update of this document was due after two years of the project we could benefit from our experiences of the formative usability testing and lab trials to plan the field trials. Therefore, we added an additional column to the actions table for the formative usability tests (Table 15) and the lab trials (Table 16) stating the results of the accordant actions.

6.1 Formative Usability Tests

A unique identifier is used to refer to a certain trial requirement. For the usability tests it should be 'T_UT-' followed by two letters for the time of action (PR = Pre-trial, DU = During-trial, PO = Post-trial) and a digit for the requirement (e.g. T_UT_PR-01). As the formative usability tests have passed at the date of the update of this deliverable, we added a short statement in an additional column how we treated each trial requirement (Result).

<i>Identifier</i>	<i>Time of Action</i>	<i>Description</i>	<i>Responsibility</i>	<i>Result</i>
<i>T_UT_PR</i>	<i>Pre-trial actions</i>			
<i>T_UT_PR-01</i>	Pre-trial	Define the place of the trials	CURE, 50plus, HWOe	Done (Details in D6.2)
<i>T_UT_PR-02</i>	Pre-trial	Define features to be tested	CURE	Done (Details in D6.2)
<i>T_UT_PR-03</i>	Pre-trial	Plan the test procedure	CURE	Done (Details in D6.2)
<i>T_UT_PR-04</i>	Pre-trial	Define the necessary devices for the tests	Consortium	Done (Details in D6.2)
<i>T_UT_PR-05</i>	Pre-trial	Buy defined devices		Existing devices have been used
<i>T_UT_PR-06</i>	Pre-trial	Recruit participants for the trials	50plus, HWOe	Done (Details in D6.2)
<i>T_UT_PR-07</i>	Pre-trial	Pay financial compensation of test participants	50plus, HWOe	Done (Details in D6.2)
<i>T_UT_PR-08</i>	Pre-trial	Create the mock-ups to be tested	CURE	Done (Details in D6.2)
<i>T_UT_PR-09</i>	Pre-trial	Define how and where personal data should be stored	AIT	Until the end of the project it is stored at CURE's
<i>T_UT_DU</i>	<i>During trial actions</i>			
<i>T_UT_DU-01</i>	During-trial	Provide the informed consent document to participating end users	CURE	Done (Details in D6.2)
<i>T_UT_DU-02</i>	During-trial	Instruction of participants and conduction of the usability tests	CURE, 50plus, HWOe	Done (Details in D6.2)

<i>T_UT_DU-03</i>	During-trial	Record the whole test procedure	CURE	Done for analysis purposes
<i>T_UT_PO</i>	<i>Post-trial actions</i>			
<i>T_UT_PO-01</i>	Post-trial	Assess gathered feedback	CURE	Done (Details in D6.2)
<i>T_UT_PO-02</i>	Post-trial	Summarize the insights for the partners	CURE	Done (Details in D6.2)

Table 15: Trial requirements for formative usability tests

6.2 Lab Trials

A unique identifier is used to refer to a certain trial requirement. For the lab trials it should be 'T_LT-' followed by letter for the time of action (PR = Pre-trial, DU = During-trial, PO = Post-trial) and a digit for the requirement (e.g. T_LT_PR-01). As the lab trials have passed at the date of the update of this deliverable, we added a short statement in an additional column how we treated each trial requirement (Result).

<i>Identifier</i>	<i>Time of Action</i>	<i>Description</i>	<i>Responsibility</i>	<i>Result</i>
<i>T_LT_PR</i>	<i>Pre-trial actions</i>			
<i>T_LT_PR-01</i>	Pre-trial	Define the place of the trials	CURE, 50plus, HWOe	Done (Details in D6.2)
<i>T_LT_PR-02</i>	Pre-trial	Define features to be tested	CURE, AIT	Done (Details in D6.2)
<i>T_LT_PR-03</i>	Pre-trial	Plan the test procedure	CURE, 50plus, HWOe	Done (Details in D6.2)
<i>T_LT_PR-04</i>	Pre-trial	Define the necessary devices for the tests	Consortium	Done (Details in D6.2)
<i>T_LT_PR-05</i>	Pre-trial	Buy defined devices		Existing devices have been used
<i>T_LT_PR-06</i>	Pre-trial	Recruit participants for the trials	50plus, HWOe	Done (Details in D6.2)
<i>T_LT_PR-07</i>	Pre-trial	Pay financial compensation of test participants	50plus, HWOe	Done (Details in D6.2)
<i>T_LT_PR-08</i>	Pre-trial	Install devices at the places of testing (Lab)	AIT, CURE, 50plus, HWOe	Done (Details in D6.2)
<i>T_LT_PR-09</i>	Pre-trial	Define how and where personal data should be stored	AIT	Until the end of the project it is stored at CURE's
<i>T_LT_DU</i>	<i>During trial actions</i>			
<i>T_LT_DU-01</i>	During-trial	Provide the informed consent document to participating end users	CURE	Done (Details in D6.2)
<i>T_LT_DU-02</i>	During-trial	Instruct participants and conduct the usability tests	CURE, 50plus, HWOe	Done (Details in D6.2)

<i>T_LT_DU-03</i>	During-trial	Record the whole test procedure	CURE	Done for analysis purposes
<i>T_LT_PO</i>	<i>Post-trial actions</i>			
<i>T_LT_PO-01</i>	Post-trial	Assess gathered feedback	CURE	Done (Details in D6.2)
<i>T_LT_PO-02</i>	Post-trial	Summarize the insights for the partners	CURE	Done (Details in D6.2)

Table 16: Trial requirements for lab trials

6.3 Field Trials

A unique identifier is used to refer to a certain trial requirement. For the field trials it should be 'T_FT-' followed by letters for the time of action (PR = Pre-trial, DU = During-trial, PO = Post-trial) and a digit for the requirement (e.g. T_FT_PR-01).

<i>Identifier</i>	<i>Time of Action</i>	<i>Description</i>	<i>Responsibility</i>
<i>T_FT_PR</i>	<i>Pre-trial actions</i>		
<i>T_FT_PR-01</i>	Pre-trial	Define the place of the trials	50plus, HWOe
<i>T_FT_PR-02</i>	Pre-trial	Define features to be tested	CURE, AIT
<i>T_FT_PR-03</i>	Pre-trial	Plan the test procedure and the duration of the trials	CURE
<i>T_FT_PR-04</i>	Pre-trial	Define the necessary devices for the tests	Consortium
<i>T_FT_PR-05</i>	Pre-trial	Buy defined devices	Consortium
<i>T_FT_PR-06</i>	Pre-trial	Recruit participants for the trials	50plus, HWOe
<i>T_FT_PR-07</i>	Pre-trial	Pay financial compensation of test participants	50plus, HWOe
<i>T_FT_PR-08</i>	Pre-trial	Pay additional costs like connection fees, insurances for the testing period	Consortium
<i>T_FT_PR-09</i>	Pre-trial	Install devices at the places of testing	AIT, 50plus, HWOe
<i>T_FT_PR-10</i>	Pre-trial	Create a manual of the test environment for the participants	CURE, AIT, 50plus, HWOe
<i>T_FT_PR-11</i>	Pre-trial	Introduce participants about the tasks they should carry out	CURE, 50plus, HWOe,
<i>T_FT_PR-12</i>	Pre-trial	Define how and where personal data should be stored	AIT
<i>T_FT_DU</i>	<i>During trial actions</i>		
<i>T_FT_DU-01</i>	During-trial	Provide the informed consent document to participating end users	CURE
<i>T_FT_DU-02</i>	During-trial	Track interactions and behaviours with the prototypes to be tested	AIT, CURE

<i>T_FT_DU-03</i>	During-trial	Maintain devices and test environment	AIT
<i>T_FT_DU-04</i>	During-trial	Support users when questions raise	50plus, HWOe
<i>T_FT_PO</i>	<i>Post-trial actions</i>		
<i>T_FT_PO-01</i>	Post-trial	Assess gathered feedback	CURE
<i>T_FT_PO-02</i>	Post-trial	Summarize the insights for the partners	CURE

Table 17: Trial requirements for field trials

References

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Appendix A List of Services offered by Hilfswerk Österreich

A.1. Existing AAL-services offered by Hilfswerk

<p><i>Emergency Phone</i></p>	<p>The emergency phone is an additional device to the fixed line telephone. It consists of a base unit and a portable radio transmitter, either as a wristwatch or as a necklace.</p> <p>The emergency call is connected to a control centre. The centre has the personal data of the caller, such as medical history and contact details of relatives.</p> <p>After clarification of the situation help is organized, either by contact with the relatives or by the rescue.</p> <p>since 1984 in Lower Austria, since 1996 Austria-wide at present approximately 5.200 connections</p>	
<p><i>Additional products:</i></p>		<p>Medication dispenser "Carousel"</p> <p>Drug delivery device, reminder</p> <p>Cost per month: € 8,50 (purchase € 189,-)</p>
		<p>Key safe</p> <p>for mounting on the wall, with access code</p> <p>Cost: € 69,90 (excluding installation).</p>
		<p>Big button phone</p> <p>larger and soft keys, an extra loud ringer, a particularly large screen, also compatible with hearing aids.</p> <p>Cost: € 39,-</p>
		<p>Electronic door lock</p> <p>Alternative to the key safe</p> <p>Cost: € 139,- to € 159,-</p>





		<p>Big button phone with picture buttons</p> <p>Similar to big button phone six phone numbers can be saved, possibility to deposit these with pictures</p> <p>Cost: € 49,90</p>
		<p>Cordless- big button phone</p> <p>Similar to big button phone Operating time up to 11 hours</p> <p>Cost: € 54,50</p>
		<p>Wireless call signal transmitter</p> <p>With LED - light and / or a loud beep</p> <p>Cost: € 65,50</p>
		<p>Smoke detector</p> <p>battery operated Easy installation - no wires Test button for regular functional test Extra Loud Signal Alarm for battery warning</p> <p>Cost: € 8,-</p>

Table 18: Existing AAL services offered by Hilfswerk

A.2. Services offered by Hilfswerk for the elderly, dependent people living at home

- Home care/Nursing Care
- Home help/ Help with dressing etc.
- Meals on Wheels / Service menu
- Rental of tools for care (hospital beds, etc.)
- Consulting Services
- Mobile Therapy
- 24-hour care

Appendix B List of Services offered by 50plus

The 50plus®CENTER concept:

In January 2009 the 50plus GmbH opened the first 50plus Centre with a scale from 600m². The centre combines the function of a chamber of older generation as representative of interests and informative offers from the time when older people go in pension.

Courses offered:

In our seminar rooms we offer following courses:

- language courses (English, Spanish, Italian, Russian, French, Polish)
- gymnastic courses (Senior gym, oriental dance, osteoporosis gym, fit in age, water gym, pilates, balance training ...)
- hobby courses (literature, painting, qigong, drumming, history ...)
- computer courses (beginners, photoshop, internet, word/excel ...)

Advisory service:

Private and public providers of social and health services offer a comprehensive range of advice on the topics of social, legal, tax, labour and social lawsuits focusing on invalid pension care and pension money.

Wellness and Health program:

The offer is supplemented by the property integrated partners and companies with segment focus 50plus®: doctors (e.g. acupuncture, orthopaedics ...) health and beauty suppliers and others who are specifically targeted by special price and service packages to the Generation 50plus®.

Event offers:

The centre offers their partners the opportunity to use rooms for lectures and convivial gatherings (e.g. lectures about travelling, health, ...)

And the operator of the centre organizes itself within the 50-plus dialogues at least once monthly presentations on topics or focus days to match the target group (e.g. value facility, spa, etc...)

Science and research skills:

New territory for the 50plus® Centre: providing over the next few years for all visitors the most modern achievements in science and research, among others in the area of Ambient Assisted Living.

Exhibition:

On 80m² the centre presents a permanent product exhibition with different partners all specialized in the generation 50plus (e.g. e-bikes, stair lift, age-based furniture (e.g. bathroom). But the Centre also presents products and prototypes to test the usability and functionality – Visitors can test the newest and modern comforts and put out a statement.

Appendix C Questionnaire

1. Bitte geben Sie an, welchen **Tätigkeiten** Sie in ihrem Alltag nachgehen und kreuzen Sie an wie häufig Sie diesen nachgehen. Bitte ergänzen Sie die Liste mit anderen Tätigkeiten.

Tätigkeit	Häufigkeit				
	nie	mindestens 1x am Tag	mindestens 1x pro Woche	mindestens 1x pro Monat	seltener
Sprachkurs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gymnastikkurs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hobbykurs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Computerkurs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beratung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Arztbesuche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wellness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Veranstaltungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ausstellungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Bitte kreuzen Sie an, welche **unterstützenden Geräte oder Utensilien**, die Ihnen einerseits ihren Alltag erleichtern und andererseits helfen gesund und aktiv zu bleiben, sie besitzen und wie häufig Sie diese benutzen (z.B. Messgeräte wie Blutdruck oder Zuckermessgeräte, Küchenwaage als Unterstützung zur richtigen Diät; oder Erinnerungshilfen für Medikamenteneinnahme wie Medikamentenspender o.ä.). Bitte geben Sie weitere Geräte oder Utensilien an.

Gerät oder Utensil	Nutzung				
	nie	mindestens 1x am Tag	mindestens 1x pro Woche	mindestens 1x pro Monat	seltener
Blutdruckmessgerät	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blutzuckermessgerät	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Medikamentenspender	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Schlüsselsafe	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Großtastentelefon	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PC oder Laptop	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TV-Gerät	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Handy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Smartphone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tablet PC (iPad)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Digitaler Bilderrahmen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Notruf-Armbanduhr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mobiler Hilfsdienst	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Essen auf Rädern	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Welche Einstellung haben Sie gegenüber den folgenden Aussagen? Bitte kreuzen Sie zutreffendes an.

Technische Errungenschaften, wie Handys oder das Internet, helfen mir mein Leben besser zu organisieren.

Ich stimme nicht zu Ich stimme zu

Ich finde es gut, dass ich mit Hilfe technischer Geräte, wie Handys oder über das Internet, mit meiner Familie und Freunden in Kontakt bleiben kann.

Ich stimme nicht zu Ich stimme zu

Mein TV-Gerät nimmt viel Platz in meinem Leben ein.

Ich stimme nicht zu Ich stimme zu

Die Nachteile, die einige technische Geräte verursachen können, gehören einfach zu solchen Geräten.

Ich stimme nicht zu Ich stimme zu

Ich finde es gut, dass alle administrativen Formulare über das Internet heruntergeladen werden können (z.B. zur Angabe von Adressänderungen).

Ich stimme nicht zu Ich stimme zu

Durch neue Technologien sind die Möglichkeiten, für jeden einzelnen länger am gesellschaftlichen Leben teilzunehmen, gestiegen.

Ich stimme nicht zu Ich stimme zu

Neue Technologien helfen mir, meine Gesundheit zu erhalten.

Ich stimme nicht zu Ich stimme zu

Appendix D Detailed survey answers of the stakeholders

D.1. Answers of monitoring centres

	<i>Possible additional use cases</i>
1	Smart questionnaires and measurements focussing on top illnesses (e.g. COPD, heart diseases, and dementia) and is set for pro-active response when the client exceeds its predefined bandwidth. Matching free volunteers and informal care
2	Einbau von regelmäßigen Feedback Funktionen um Krisensituationen rechtzeitig wahrnehmen und reagieren zu können. Nutzung von GPS um bei Hilferufen u.ä. gezielt reagieren zu können.
3	Medizinisches Monitoring (z.B. Vitalwerte, Diabetes)

Table 19 Suggestions of other possible use cases of AALuis related to the Intervention Service scenario

	<i>Reasons</i>
1	A computer could never replace a human being
2	The service does not support the user. On the other hand it is too banal.
3	Steuerungseinrichtung, weder Anbieter/Betreiber solcher Services, noch Kostenträger
4	We currently only monitor help-lines with pendants. We are a small organisation. The majority of our clients do not have internet connections. We do not have the time or the funding to invest in something like this.
5	Weil ich in einer Organisation arbeite, wo der Hausnotruf in erster Linie für den Notfall (Rettung) zuständig ist.
6	Weil wir derzeit nur vereinzelt persönliche Betreuung betreiben.

Table 20 Reasons of the statement that a service as in the Intervention Service scenario could not support the participant's organisation

	<i>Reasons</i>
1	Ausgleich von zukünftig noch weiter fortschreitendem Personalmangel
2	Das kann ich jetzt noch nicht vorher sagen.
3	Entwicklung bedarfsgerechter Dienstleistungen
4	Es könnten hiermit weitere Angebote für z.B. betreutes Wohnen angeboten werden
5	First line support instead of building FAQs on websites that customers need to brows first, this intelligent intervention Service will (probably) more effective for our customers, and reduce the need of people responding to the questions of customers
6	Improved efficiency, potential wider working
7	It will take the pressure of the employees to enable them to help most speedy in more severe problems
8	Kostendämmung, effizienter Personaleinsatz
9	Make planning-based contact from monitoring/ telecare centre to clients (outbound) suitable for a larger group

10	Neue Kunden gewinnen (jünger). Das Angebot der Dienstleistungen des Verbandes ständing dem Teilnehmer zur Verfügung zu stellen. Angebote in Regionen (Gemeinden etc.) mit private Kooperationspartner anbieten (Beispiel Mia)
11	Uitbreiding van diestverlening (Ausbreitung der Dienstleistung)

Table 21 Reasons of the statement that a service as described in the Intervention Service scenario could support the participant's organization

<i>Possible additional use cases</i>	
1	When a professional caretaker visits a client he sees (out of experience) triggers that indicate a client's change of behaviour (e.g. closed curtains, medication taken, warm glasses from coffee or tea). These triggers can be automated.
2	Angedacht ist in unserem Haus bereits ein Telefonchat für Senioren. Halte ich für eine gute Idee.
3	Neben der "guten Morgen Kaffee Runde" wäre auch die Bildung von Neigungsgruppen (Hobby oder gemeinsame Interessen) denkbar um auch tagsüber den Austausch zu animieren.

Table 22 Suggestions of other possible use cases of AALuis related to the New Good-Morning-Service scenario.

<i>Reasons</i>	
1	Steuerungseinrichtung
2	Unsere Abteilung kümmert sich nicht um die Betreuung der Kunden im täglichen Leben.
3	We are doing security monitoring and don not call our clients in the morning for a Good Morning Service. We do, however, monitor time-tables that shops should be open (disarmed) and when shops are not disarmed according to the time-table we do give them a call (not a good morning call)
4	Weil diese Art von Betreuung nicht in unserem Programm ist.

Table 23 Reasons of the statement that a service as in the New Good-Morning-Service scenario could not support the participant's organisation

<i>Reasons</i>	
1	Es wäre eine neue Kommunikationsebene mit pflegebedürftigen Mitgliedern
2	Kostensenkung, besserer Personaleinsatz, attraktiveres Angebot für die Kunden/ Klienten
3	Mooie nieuwe diestverlening, gezien vergijzging waarschijnlijk groeimarkt (Schöne neue Dienstleistung, hinsichtlich der zunehmenden Vergreisung wahrscheinlich ein Wachstumsmarkt)
4	Provide in an efficient but still personal substitution of client visits by professional caretaker.
5	Vorhandene Dienstleistungen bei erkennbarem Bedarf, sofort anbietbar
6	Wir könnten eine größere Kundenbindung erzeugen
7	Zusätzliche Erkenntnisse und Erfahrungswerte

Table 24 Reasons of the statement that a service as described in the New Good-Morning-Service scenario could support the participant's organization

D.2. Answers of caregivers

<i>Possible additional use cases</i>	
--------------------------------------	--

- 1 We think that an AALuis for GPS (in response to wandering behaviour of clients with mild to moderate dementia or improving mobility of client with MCI or mild dementia) and AALuis for improving social activities for clients and carers in the case of dementia would be worth developing.
- 2 Meldung von Vorfällen wie Stürzen, Nachtaktivität etc. an eine zentrale Leitstelle oder - wenn sich dieses System in einer Seniorenbetreuungseinrichtung befindet - an das diensthabende Personal
- 3 Erinnerung an bestimmte tagesstrukturierende Termine (Aktivitätsangebote, Therapien,); Arzttermine, Geburtstage, etc.; Erinnerung an Trinken
- 4 Nicht nur Erinnerung an Medikament sondern auch an Insulinspritzen, Trinken, Essen, Tipp des Tages, Geburtstagserinnerung, vielleicht könnte man auch durch Netzwerke Leute miteinander ins Gespräch bekommen, oder online Spiele miteinander durchführen.
- 5 Senioren sollten einfach eine Nachricht hinterlassen können, wenn sie das Haus verlassen und wenn sie zurück sein möchten. Wenn der Zeitpunkt überschritten wird, könnte eine Info an das Callcenter oder Angehörige erfolgen.
- 6 Notrufsystem implementieren Sturzerkennungssystem; Kommunikation mit Verwandten z. B. über Tablet Computer (Telefonieren, Skypen); Günstig alles in einem Gerät zusammengefasst
- 7 Erinnerung an Aufstehen, Essen, Trinken, Körperpflege, Lieblingssendungen im TV und Radio,
- 8 Erinnerung an verschiedene Termine z.B. Arzt, Friseur, Fußpflege, etc.
- 9 wenn gewünscht wird, einen täglichen Besuchsdienst um auf Bedürfnisse v. alten Menschen einzugehen z. B. mit älteren Menschen zu reden und zuhören, ohne den älteren Menschen einen Zeitdruck anmerken zu lassen.
- 10 Wir betreuen offensichtlich stärker demente bzw. pflegebedürftige Personen, bloße Erinnerung an Medikamenteneinnahme würde nur sehr selten ausreichen
- 11 zeitliche Orientierung zum Tag. Nach dem Mittagsschlaf wird angenommen, dass das Frühstück fällig ist.
- 12 Fahrtendienstvermittlung, Onlinebefunde
- 13 weitere Felder: Messung des Körpergewichtes, Anschlussmöglichkeiten von Brand/Gas/Wassermeldern, Einbruchschutz, Lichtsensoren die z.B. den Weg des Kunden vom Bett zum Bad beleuchten, Fallsensormatten, Blutdruck-/Pulsmessgerät, Blutzuckermessgeräte, Medikamenteninkompatibilitätsprüfung, Servicestelle für Dinge des täglichen Lebens (Arzt, Behördengänge, Pflegedienst, Einkauf), Kontaktaufnahme mit Verwandten und Freunden über Bild und Ton.
- 14 individuelle Alltagsstruktur von Senioren erhalten und unterstützen, sprich Erinnerung an Mahlzeiten, wichtige Nachrichten zum täglichen Geschehen auf regionaler Basis. Erinnerung zu Aktivitäten, Seniorentreffen, ... am besten mit Sprachmodul, da Menschen mit wenig persönlichen Kontakten wenig zum Sprechen motiviert werden.
- 15 Erinnerungsfunktion an das Trinken in Abhängigkeit zur Wetterlage
- 16 Eine tel. Ansprache zumindest 1x am Tag, da viele alte Menschen allein leben. Verschiedene Serviceanfragen (Angebote zu Theater, Kino, Pediküre etc.), eventuell mit anderen alleinstehenden Personen, um Leute aus dem Alltag zu holen. Praktische Anwendungen, via die Abfrage von täglichen Konsumgegenständen und der Konnex zu professionellen Boten- und Einkaufsdiensten
- 17 Monitoring von Blutdruck & Herzfrequenz, Sturzmonitoring, Versorgung mit Alltagsgütern (Schnittstelle zu Apotheke, Bäcker), Kalenderfunktion, Möglichkeit des Zusammenschlusses von Rauchmeldern, Wassersensoren etc.,
- 18 Einnahmeerinnerungen bei Psycho-Patienten; Erinnerung auch an die Pflegeperson sinnvoll

- 19 Unterstützende Tätigkeiten im Bereich Pflegedokumentation (Gewicht, Zustand, Blutdruck etc.);
Unterstützende Tätigkeit im Bereich Hauswirtschaft (Staubsaugerroboter)

Table 25 Suggestions of other possible use cases of AALuis related to the Medication Reminder Service scenario.

	<i>Reasons</i>
1	Derzeit werden Leistungen nur dann abgerechnet, wenn Mitarbeiterstunden vor Ort anfallen. Somit würde AALuis dem Klienten helfen selbständig zu bleiben. Eine Überwachung ob Med auch eingenommen wurden und ob die Erinnerung wahrgenommen wurde gibt es nicht. Der Institution (öffentlich/gemeinnützig) würden Leistungsstunden verloren gehen.
2	weil Medikation meist nur eine der Tätigkeiten darstellt, warum formelle Pflege in Anspruch genommen wird;
3	Zu wenig Sicherheit, dass ein wirklich dementer Mensch nicht trotzdem vergisst, kleine Lösung bei höherer Pflegebedürftigkeit/ Demenz; Vermutlich eher eine Unterstützung bei Personen, die noch gar nicht betreut werden
4	Bei "vergesslichen, dementen" Personen sind aufgrund der medizinischen Medikation die Vorbereitung der Medikamente durch Fachpersonal erforderlich. Lediglich die Erinnerung kann durch ein CallCenter erledigt werden. Und dieses Service gibt es bereits durch eine zusätzliche Taste am Notruftelefon - sprich Servicetaste.
5	Da wir eine Notfall und Hilfeleistungsorientierte Organisation sind und kein Pflegedienst.
6	weil es die MA nicht, bzw. nur unregelmäßig benützen würden
7	Medikamentenvorbereitung bei Vergesslichkeit ist nur durch telefonische Anleitung nicht genug sicher. Medikamente sind für Personen mit Orientierungsverlust durch fachpersonal oder Angehörige vorzubereiten. Lediglich die Erinnerung an die Einnahme kann über ein Callcenter durchgeführt werden.
8	es ist zu sehr an der Oberfläche der Probleme
9	Warum nicht hilfreich in der Organisation? Da sich das Klientel ab der Pflegestufe 4 bewegt und die Demenz schon sehr im Vordergrund ist. Die Bewohner müssen teilweise mehrere Medikamente zu verschiedensten Zeiten einnehmen und das Pflegepersonal trotz des AALuis gefordert wäre, weil es mit der Erinnerung alleine nicht abgetan ist. Die Installation des neuen Systems kostet sicher einiges, Ersparnis auf lange Sicht in welcher Weise? Die Entscheidung einer Veränderung durch ein neues System in einem Pflegeheim ist immer Konzernabhängig. Für Menschen die dadurch länger im Eigenheim verbleiben können, ist diese Technik mit Sicherheit ein Vorteil und zukunftsorientiert.
10	Bei Demenz und Verwirrtheit stellen nur persönliche Kontakte die Einnahme sicher. Wir ermöglichen menschlichen kommunikativen sozialen Kontakt dazu.

Table 26 Reasons of the statement that a service as in the Medication Reminder Service scenario could not support the participant's organisation

	<i>Reasons</i>
1	Da ich selbst nicht in den direkten Pflegeprozess involviert bin, kann ich das nicht wirklich beurteilen.
2	Zur Verfügungstellung an Kunden
3	Im Umgang mit den Kunden und Kundinnen, neues Dienstleistungssupportangebot, Vergesslichkeit der Kundinnen entgegenwirken usw.
4	Hauskrankenpflege hätte Überblick
5	Es erhöht die Wahrscheinlichkeit, dass auch Personen, die noch versuchen selbständig zu leben,

	obwohl sie nicht mehr 100% orientiert sind, ihre Medikamente einnehmen.
6	Nur durch Freiwilligkeit. Das organisieren und anwerben durch die Organisation
7	Kostengünstige Bereitstellung der erforderlichen Software.
8	Indem von einer zentralen Stelle aus, die zu unterstützenden Personen oder ihre Angehörigen entweder direkt per Computer oder auch per Telefon informiert oder erinnert werden.
9	Unterstützung des Mobilen Dienstes, der vor Ort die KlientInnen versorgt.
10	Komplikationen durch vergessene Medikamente könnten vermieden werden, das Monitoring verbessert.
11	Kundenbindung, Umsatzsteigerung, Cross-Selling, Innovation, Strategische Vorteile
12	Vermeidung von Übermedikation, Verlängerung des Lebens zuhause
13	Teilweiser Ersatz von tatsächlich physischen Besuchen, da Medikamente vom Kunden selbst eingenommen werden. Kontrolle des allgemeinen Zustands bzw. bestimmter gesundheitlicher Werte (Blutdruck, sonstige Messwerte etc.) via tel. Service bzw. AAL
14	Rezepte besorgen, bewilligen einfacher
15	Zusatzservice für den Kunden, das verrechnet werden könnte bessere Bindung der Kunden Unterscheidung vom Wettbewerb
16	Kostenmäßig ist sicherlich ein Vorteil für eine Organisation zu erwarten. Allerdings gehen durch die Erinnerung mit technischen Geräten soziale Kontakte verloren. Wenn es nicht unbedingt sein muss, würde ich eine persönliche Erinnerung im stationären Bereich nicht durch technische Hilfsmittel durchführen. Im Bereich der Hauskrankenpflege erscheint eine solche technische Unterstützung allerdings durchaus sinnvoll.
17	Kundenorientierung; verkaufbarer Zusatznutzen für Kunden
18	Bezüglich verhindern von Patientenaufnahmen.
19	Sicherstellung, dass alte Menschen länger zu Hause bleiben können
20	Es wäre ein zusätzliches Feature für die betreubaren Wohneinheiten
21	Einsatzleiterinnen entlastend; Spät- u. Abenddienste erleichternd
22	Keine Daten für eine solche Aussage vorhanden
23	As part of a total of online services which we can offer for free to clients

Table 27 Reasons of the statement that a service as described in the Medication Reminder Service scenario could support the participant's organization

	<i>Possible additional use cases</i>
1	Blutzucker, Gewichtskontrolle usw.
2	Zu starker Fokus auf rein körperliche "Beschwerden", Ganzheitlichkeit fehlt (biopsychosoziales Wohlbefinden)
3	Die Hardware, Geräte und Schulungen der Freiwilligen durch das amtliche Gesundheitswesen (Krankenkassen)
4	Verschiedene Vorschläge, um sein Leben besser führen zu können; z.B. Diabetiker - Tipps oder auch kleine Hinweise, wie sich welche Art von körperlicher Betätigung auf den individuellen Gesundheitszustand (Herz-, Kreislauf, Diabetes etc.) auswirkt. AAALuis rechnet z.B. eine bestimmte Punktezahl aus, wenn KlientIn Vital-Daten + Details über tägliche Lebensführung (wie viel Bewegung, was gegessen) eingibt. AALuis gibt auch Vorschläge für gesunde Ernährung oder

	Bewegung.
5	gemeinsamer Zugriff von Arzt und Pflegeperson auf die Daten - da steckt die komplette ELGA Problematik drinnen erst sinnvoll wenn relativ viele Hausärzte mitmachen
6	Blutdruck, Blutzucker, Gewicht, Flüssigkeitszufuhr, Anzahl der Mahlzeiten, kognitiven Test – tgl. eine kleine geistige Aufgabe,
7	Übermittlung der Daten über das vorhandene Hausnotrufgerät in die Notrufzentrale
8	so wie es beschrieben ist, sinnvoll, allerdings nur in Kombination mit tatsächlichen Pflegevisiten, auch abhängig vom Allgemeinzustand des Kunden
9	elektronische Patientenakte und elektronische Pflegedokumentation
10	ev. Diätplanverwaltung; tägliche Physio-Therapie-Übungen überwachen
11	It might be valuable to monitor the frequency of behaviour problems and the way carers react to it and to give them advice on the way of coping with this kind of problems.
12	Die Heimhelferin darf nicht Blutdruck messen, sie erinnert ans Messen und verständigt den Arzt. Es wäre ein Kontakt zum Arzt notwendig. Der Alarm hilft der Organisation gar nicht.

Table 28 Suggestions of other possible use cases of AALuis related to the Health Monitoring Service scenario.

	<i>Reasons</i>
1	Könnte zu einer Entlastung des Pflegepersonals führen, da viele lange Wegzeiten wegfallen würden.
2	gemeinsame Nutzung mit Kunden
3	neue Dienstleistungsangebote für chronisch kranke Menschen. Service und Begleitung im Vordergrund. Bessere Kommunikation. Vorbehalt die Menschen können mit der Technik umgehen.
4	zu medizinisch orientiert, daher in dieser Form keine Unterstützung
5	Für unsere Organisation (Seniorenbund) eine hilfreiche Einrichtung, die unseren "alten" Mitglieder und allen Personen, die allein sind, hilfreich zu unterstützen
6	Als Service für unsere Mitglieder.
7	Indem wieder von einer zentralen Stelle aus, die beschriebene Hilfestellung organisiert wird.
8	Besseres Monitoring chronisch kranker KlientInnen und Unterstützung der Selbständigkeit der KlientInnen
9	Klienten könnten laufend ihre Daten übermitteln und so das Monitoring verbessern.
10	Aufbau einer vernetzten integrierten Gesundheits/Pflegeversorgung sicher sinnvoll
11	schnelleres eingreifen bei Problemen
12	Kundenbindung, Cross-Selling, Innovative neue Geschäftsfelder, strategische Vorteile.
13	rascher Verfügbarkeit der Werte zur gleichen Tageszeit für den Kunden, für die Organisation weniger Planungsdruck bei den Fachkräften, bessere Zeitspanne bei der Betreuung für soziale Anliegen.
14	Erweiterung des Leistungsspektrums für finanziell abgesicherte Kunden
15	In dem eine echte Abstimmung zwischen mobilem Dienst, Arzt und anderen Einrichtungen des Gesundheitssystems gegeben ist (z.B. Krankenkasse, Krankenhaus).
16	durch zeitliche Ersparnis von Pflege- und Dokumentationsprozessen

17	Zusatzservice, umfassenderes Wissen über Kunden, Sicherheit für Angehörige, die dadurch uns als Organisation wählen
18	Man könnte mehr Menschen betreuen - Sicherheit, dass regelmäßig alle Vitalparameter gemessen werden (auch ohne regelmäßige Unterstützung durch eine Pflegeperson) und auch ein Alarmsystem eingebaut ist
19	Verkürzung der Einsatzzeiten -> Kostenreduktion
20	z.B. Therapeuten haben einen Überblick, ob die Patienten selber auch tägliche Übungen machen.

Table 29 Reasons of the statement that a service as in the Health Monitoring Service scenario could not support the participant's organisation

<i>Reasons</i>	
1	Die Organisation müsste sich öffentlich der Frage des Datenschutzes und des gläsernen Menschen stellen. Die Kommunikation nach außen wäre sehr schwierig und könnte einen schlechten Ruf erzeugen. Bei Systemausfällen/Problemen müssten sich Klienten eventuell mehrmals in den Finger stechen, und das umsonst!?! Wenn z.B. beim Blutdruck ein Messfehler entsteht - wer trägt die Haftung bei gesundheitlichen Folgen?
2	Kontrolle von Blutdruck oder Puls erfolgt meist in Zusammenhang medizinischer Behandlung - Arzt entscheidet über eine Therapieänderung und benötigt die Werte erst danach entscheidet der Arzt, inwieweit er die Pflegepersonen miteinbezieht, z.B. zur Information und Beratung der Patienten
3	Blutdruckmessung ist für Pflegepersonen von Bedeutung, um zu wissen, ob sie den Patienten mobilisieren können - erfolgt direkt vor der pflegerischen Intervention
3	Die Organisationen Haushaltshilfe, Hilfswerk etc. würden das angeführte Service als Störung ihrer Arbeit betrachten.
4	Weil wir derzeit dieses Service nicht anbieten.
5	die Klienten wären überfordert
6	das Angebot ist zu oberflächlich
7	Arzt kann eingreifen bei Bluthochdruck, nicht die Heimhelferin!

Table 30 Reasons of the statement that a service as described in the Health Monitoring Service scenario could support the participant's organization

D.3. Answers of Developers

	<i>Possible additional use cases</i>
1	Maybe combine it with more fun, I don't think that people like to cook with specified recipes. I like to cook as I want (I try to cook as healthy as I can), maybe it makes more sense to just type in the food I needed to cook my meal, and rather than using canned recipes.
2	If the user wants to share his diet or a recipe with his friends or relatives he/she would like to use his/her social networks links.
3	Medication, Diagnoses, Allergies, Schedules, Keeping track of the multitude of passwords and codes
4	The basic idea of a middleware is not that bad and already available for many situations. I think it even is the problem that the middleware concept is SO popular, that there again are too many options and a developer finally again ends up in additional interfacing work. For a (G)UI the point is that this part of implementation usually is the smaller part, whereas the "logic" behind takes more time for implementation.
5	I think this scenario is very common, but also very generic. I think that is also too little technical, as developers we want to see how it works, and how it would simplify our work. I don't understand how AALUIS would support development; the things described are typical for this domain and it is not clear for me what the middleware does. Maybe it would be more interesting to show what you are planning to offer, or if you don't know yet (or don't want to tell it yet) maybe it would be better to show which are the problems and try to capture the needs of the developers (and all the team working with them). I'll give some examples: 1. you have a graphic designer who creates drafts of the interface with typical graphic tools like Photoshop, Freehand etc... how would you support the developer in mapping the design into code? 2. user interaction designers, as well as clients, always change their mind about the flow of information, how do you support this continuous change of requirements? 3. the information displayed on the screen often is a mix of static data and dynamic data (e.g. taken from the DB), how would you make it simple to edit this information so that the programmer is not even involved? 4. multi display capability is important (I think it is included in this scenario), but the real hassle for the developer is to avoid programming an interface per device, he wants to do it once.
6	Access to transport information. Access to Local simple services such as meals-on-wheels... Connecting Informal Caregivers with elderly people closer Management of daily economy (budget, available cash, use of known interfaces at the ATM...)
7	It could be useful for the development of all kind of interfaces.
8	Especially telemonitoring services, like heart rate monitoring, or medicine dispensers
9	1. We have developed a new functionality on an eHealth application in which the patient will be able to contact a doctor asking questions and getting answers on-line. The system will be used by user using a standard web browser. However we would like to make this available for a patient and a doctor on different devices like tablets (android, IOS) and smart phones. AALuis could make this porting much faster or even seamless. 2. We also implemented a therapeutic control process on our eHealth platform. We would make me more than happy to port it for users to other devices.
10	AALuis can be used for every telemedicine and e-health services that includes client-server interactions.
11	A cross-platform middleware might also be useful to connect home devices with hospital information systems
12	A scenario that includes migration of existing service onto the new platform would be nice.
13	Services for disabled people
14	You need to map the diet to the actual offerings from stores in the area, so that users can see where they can buy the items. Price comparison should be possible, so that the user can see where he gets the best diet to the best price. Should also be possible to order the food to be brought. Interoperability with food providers is therefore essential. If not, this service is similar to thousands of other services available. The db must be internationalised, so that you can get the recipes on many

	different languages. And also possible to specify what region you are in, so that you get customised menus etc.
15	Filling in timesheets by employees on the move; Keeping track of health records
16	Filling in e-diaries on general health, falls. This data can be used as feedback to give user more insight in his/her activities and the effect on their health/well-being. Additionally, this is useful information for the general practitioner, therapists etc... Feedback on the delivered services (i.e. the recipe from the example). Reminders for taking certain actions at certain preset times (i.e. taking medicine, physical activity, rest etc....). Compliance can be checked in this way and the user will be motivated to be more punctual in performing the desired action.
17	Any health service that collects measurements from the user needs to interact with different devices (depends on the current context) in order to send alarms and notifications to the user
18	Millions. However: They have to be designed with the users and not invented by developers. I am not the target group to draw use cases from.
19	The companies' internal services developed by companies for managing e.g. their internal information system
20	The program could also give - for example - the amount of Natrium in the prepared food so that users who should be careful with regard to Natrium keep track of the amount of Natrium they eat.
21	Offering the possibility of reporting and getting advice regarding physical exercise done or to be done.
22	Other use cases include the following ones: * medication reminder (in order to know when you should take your pills and the doze); * propose some appealing activities (in order to promote social activities to elderly people lying on the sofa at home) * helping with ADLs (in order to help elderly to cook by themselves or to manage their bank accounts, etc.)

Table 31 Suggestions of other possible use cases of AALuis related to the Service Developer scenario.

	<i>Reasons</i>
1	Maybe combine it with more fun; I don't think that people like to cook with specified recipes. I like to cook as I want (I try to cook as healthy as I can), maybe it makes more sense to just type in the food I needed to cook my meal, rather than using canned recipes.
2	We are one of suppliers in the healthcare market, so this scenario is not helpful for the organization
3	The Middleware is not our main development challenge. The development of new products wouldn't speed up much.
4	We are making assistive technologies for people with reduced cognitive functions. I think the idea of AALuis is good, but our company is not focusing on diet/foodmaking. But this is important, and I wish you good luck :-)
5	I don't believe that the quality of the user interface will overcome the other higher barriers to technology usage in this scenario.
6	I am a developer and not the intended user. However, I have the feeling that users might be very happy with the device as described.
7	It's note helpful since my organisation is also involved in R&D projects with similar goals to AALuis. We've already developed some medication reminders and some healthy diet tips for a tele-assistance service that is used in rural areas.

Table 32 Reasons of the statement that the AALuis middleware as described in the scenario could not support the participant's organisation

	<i>Reasons</i>
1	It would be very useful as we would be capable of build new services in top of it such as the new use case suggested.
2	It could help if there are underlying services which can be reused. Just flexible UIs don't make the service. So the question at the end will be if you can use the AALuis components with the certain services or applications.
3	We are also in the role of interface implementation -- so if the middleware would REALLY reduce efforts it would be worth to think about.
4	I haven't understood what the middleware does, so I can't be very specific. I think the scenario should be more specific, sorry....
5	If it can be easily used/integrated by other middleware solutions
6	It can save many lines of code. It allows applications to be executable in different places keeping the same user interfaces. It offers the possibility to easily configure different UI according to user preferences or user evolution as ages. However, it is not clear how it could be instantiated in a real scenario, with the current existing barriers. For instance, where does the middleware run? Are users able to configure it? If not, who configures? Is the middleware compatible with existing platforms? Who it competes with and why should I use AALUIS as an option?
7	We do not have to invest in development of user interface and update mechanisms, but can focus on the actual development of our service/product. And our end-users will have a user interface with which they are already accustomed, which decreases the learning curve and increases the adoption rate
8	Elder people have difficult to learn new thinks especially to use new applications. AALuis could create a standard UI (colours, logic, toolset) which different applications could use for delivering their functionalities to the end user on different devices. AALuis could a great tool to port applications and keeping similar logic on different devices.
9	Reduces development effort; Sets user interface standard we don't have to think through anymore
10	it could serve as a basis for student work
11	for managing User Interface for general application
12	I think it could be useful in different scenarios of the AAL
13	- in developing UIs
14	To develop demonstrators for potential customers/partners. Learn from it and see if there are any smart solutions that we could adopt.
15	To support innovative interfaces for services for disabled people
16	Providing home control and information/communication smoothly across different UI platforms, mainly touch-screen PCs and tablets
17	By providing a more regulated development environment
18	The product we develop (hardware and software for monitoring of physical activity) does not lend itself for use with AALuis at the moment. Maybe in the future (after we developed the product further) I can imagine the AALuis middleware could be used to couple our objectively measured data on physical activity (which can be stored in a database) to i.e. a diary of a subject on how he/she feels (tired, energetic, pain, etc...) during the collection of the data. Also, the AALuis could be used to give the subject access to a database with relevant exercises, which can be tailored to the subject's physical status (activity level) and feedback
19	It might support research after new innovations.
20	AALuis could serve us as a platform to integrate contents from diverse content providers, in order

built integral and personalised services for the elderly (or for other user groups such as people with some kind of disability or chronicle disease)

Table 33 Reasons of the statement that the AALuis middleware as described in the scenario could support the participant's organisation

	<i>Possible use case</i>
1	business homepages, user manuals, etc.
2	- voice/audible interface for the blind
3	I haven't experienced the "extension" of users in the project I have worked, but still the scenario is interesting. Again it is not clear to me what the tool does and what is the role of the style guide, is it a sort of reusable style sheet (like css for html) ? I would for instance design the new style guide with the users themselves and not the health care provider. Another example could be "expert users" and "basic users", for instance basic users can be elderly people, or people who are not used to technology in general. Down it asks things about the middleware, but here it is about the user interface layer, isn't it? (or is the layer part of the middleware?)
4	Yes, could be for people with dementia, for children, all kind of groups
5	A simplified interface for the mentally challenged. Often they need a simple UI with as clear as possible meaning
6	We have experience with this type of solutions in Hospitals
7	Depending on the granularity and functionalities, universAAL could be a set of objects/components which could be used by different components. Additionally it could increase interoperability and ease of integration of the systems using uAAL.
8	Yes, even if you are working with a specific group, you need to create and adjust the UI for particular group of people, and guidelines are very useful
9	This kind of UI development tool might also be applicable to health-related mobile application
10	There are many other needs for elder people, like demands of medicine, transport and usual food and drinking requirements
11	Could add design time validation/QA. And perhaps provide a simulation?
12	It seems a little complicate with the extra Layer, why don't make the system user friendly for people with poor eye sight in the first place? And/or include voice?
13	Since our core business is developing hardware and (specific) software, the AALuis would not be usable for those activities. However, we also provide feedback to end-users (patients, therapists etc) and in this case AALuis could be helpful to develop reports on a subject's physical activity.
14	Many. Please engage with users to capture the details.
15	Yes, considering User Interfaces especially adapted to other user groups: the elderly (big characters, increased colour contrast, tactile functionalities), users with hearing impairment (voice interaction)
16	Other use case could involve the use of the AALuis system by people with hearing impairments or by people with mobility impairments (upper).

Table 34 Suggestions of other possible use cases of AALuis related to the Service Developer scenario.

	<i>Reasons</i>
1	Because my organization has developed other AAL middleware.
2	We are not directly involved in the UI building of our products, but I can imagine that other firms in

	our product creation cycle can benefit.
3	Again, the technology is not the bottleneck in our development team.
4	Healthy diet is very important, but I cannot answer "Yes" on behalf of our company to the questions raised.
5	The quality of the user interface does not matter if the other barriers to device adoption are higher.
6	AS already mentioned, we're a R&D organisation working in the development of similar systems to AALuis.

Table 35 Reasons of the statement that the AALuis middleware as described in the scenario could not support the participant's organisation

	<i>Reasons</i>
1	development of new psychological intervention modules especially for elder people
2	By developing the same service in our city.
3	As said important will be the possibility of integration of existing solutions or platform concepts.
4	See comment for the previous scenario. Nothing to add.
5	A tool that helps designing user interfaces for different profiles is good, but it should not only include things like the dimension of the fonts or the colours, but, especially, identify what amount of information should be visualised. This is the most challenging part.
6	It definitely saves time because it is easily pluggable and reusable in several services. It avoids that we loose time with UI and it allows relying in existing guidelines to deal with UI and elderly. The connection with universAAL is nice (because I know about it) but other readers might have problems to understand.
7	Easy access to the information you need instead of looking on all different kind of sites to loop up your answer.
8	We have to develop a lot of components which could be created by uAAL as a library, similarly to GWT.
9	Reduce development effort; Reduce time involved with setting up user interface guidelines
10	Yes. Especially for create particular UI
11	I think for our purposes the UI development kit might be more useful than the HW-based tool. We deal with many different types of users who might benefit from a common front page.
12	It could be useful for many scenarios
13	If there are any smart solutions in the middleware, we would probably look at it and see if we could use/adopt it.
14	Taking this even one step further in future by linking AALuis directly and individually via a user description language. Thus creating individual UI presentations even with some kind of context awareness.
15	We provide feedback to end-users (patients, therapists etc) and in this case AALuis could be helpful to develop reports on a subject's physical activity.
16	This middleware might help to create quickly a prototype, which could be used for research purposes.
17	Will help to adapt user interfaces to different user groups

Table 36 Reasons of the statement that the AALuis middleware as described in the scenario could support the participant's organization

	<i>Key Technologies</i>
1	Programming languages and target platforms and devices
2	virtual realities; HTML; mobile devices, such as iPad
3	We use java, xml, eclipse, android devices.
4	HTML, Typ03, flash,
5	Java; Windows basically; tablets, android devices etc.
6	Java, .NET, FoxPro
7	JAVA, different versions of C, Delphi
8	Java Swing, .Net, .Net compact framework, Android, Java SWT
9	Java-based frameworks. HTML. Ontology-based interfaces.
10	Flesh, Flash, NetBeans, Silverlight, universAAL UI Framework
11	Touchscreen, iPad, HTML, Masc platform, Flash
12	*C++, PHP, Flash, AJAX, JS, HTML * Windows platform, Android platform, iOS platform, Linux platform; * PC, Laptop, Tablet, Mediacenters
13	GWT, php, CSS, Java; User Platforms: PC, tablets (android and IOS), smartphones. Database: postgresQL
14	(Webkit) browser / Javascript / JSON
15	Java, OSGI, Qt, Android
16	Agile, .NET, Zend, XCode, Eclipse
17	C# or Java. Mobile application like Android.
18	Android, C++, Java
19	KD4 C++ for simon Open SOurce speech recognition
20	Java, UML and MDD
21	We use our experiences as family caregivers, in-put from other caregivers and focus groups, with care professionals and elderly people with cognitive disabilities. In my experience, many professionals have too little experience with technology for elderly people with cognitive disabilities.
22	Mainly target platforms and devices
23	programming languages
24	We use a web-based interface (drupal) and databases (php) and Matlab. We also use office (word, excel) to create reports.
25	java - struts, JSF; Flex
26	Dynamic web pages using Java EE technologies.
27	Java on Android and PC, HTML, XML and stylesheets

28	HTML, CSS, HTML5, Ruby, PHP, etc.
29	As I am working in a University of Applied Sciences we do make User Interface now and than for research and teaching purposes. A typical example of a tool we would use is Netbeans to develop a UI in Java.
30	Java, Android, iOS; Eclipse, NetBeans, Swing, .Net, Visual Studio; mobile platforms: smart phones, Tablet PCs

Table 37 List of key technologies used by the developers: programming languages, frameworks, target platforms and devices

<i>Characteristics and features of AALuis</i>	
1	Templates, standards
2	It may need to make use of accessibility APIs.
3	voice interaction layer
4	As said it must be able to interface the services and applications
5	*UI - control-elements with a rich collection of properties and methods. *A rich set of ready-to-go control-elements for common tasks (i.e. birthdate-input-field with already built in validation) *a modern UI for the AALuis framework and formbuilder itself *connectable to the "Cloud" via all available wireless and wirebound technologies *built in location and routing services *controllable from other applications in different programming languages
6	it is an obvious comment -- but it should SAVE effort
7	all of them are good candidates
8	Easy-to-use. Declarative definition of UIs when possible, without weakening programmatic use. Graphical tools for composition and preview.
9	Reusable templates; Separation of presentation aspects from business logic Capability of personalization and tailoring
10	Easy access to information for example about eyesight problems. But it will be hard to make the interfaces work on all different kind of services, cause unfortunately the devices all use different software etc.
11	Support for internet based (HTML plus supporting technology) rendering of the UI, and support for different 'pointing' devices (from mouse, remote control to touchscreen)
12	Applicable in Javascript/Browser environment; Applicable to touchscreen devices, without using keyboard and mouse
13	platform in dependency, small overhead to be applicable to embedded systems
14	it can be multiparametric
15	APIs to connect to existing development tools, e.g. eclipse
16	It, necessary to check it??
17	Rich library of examples, good tool support and proper documentation
18	I am unsure whether this will be a relevant for what we are doing.
19	It should be open to special interfaces designed for motor disabled people
20	gradual scalability to user needs, not only fixed impairment classes

- 21 Using database input for creating feedback reports
- 22 Simple; Tutorials and examples; Easy to configure; Available implementations that connect the service to many existing devices
- 23 We develop our software with the tools that we have and found this sufficient.
- 24 Support material, guidelines, experts support, etc.
- 25 It should be easy to build a UI quickly, for instance for prototyping.

Table 38 List of characteristics and features, that the AALuis Layer should have, so the developers can and will use it

<i>What is needed to make AALuis a long lasting and widely used Open Source project?</i>	
1	To be tested with end users (validation and evaluation with good results) and afterwards it should be disseminated.
2	Availability in several languages
3	Online support, a user and developer forum.
4	a focus on the exploitation process/activities to the target community, a place to share developed components with other developers, a strong connection to commercial standards
5	A coordinated and "real" open source process. Not just something to download. A community with developers also outside AALuis to integrate their needs and experiences.
6	* Strictly defined interfaces and hooks; *centralized quality control before something; * new is added to the public; *many generous and qualified programmers ;-)
7	I don't have a complete overview about other similar middleware packages. It definitely should be more than the (G)UI function, but also include standard AAL components (if this isn't already planned anyway)
8	Be simple; make the development easier, you shouldn't require a PhD to understand it. Should be integrated with IDEs (Eclipse or Visual Studio for instance). Include Android and possibly also the iPhone/iPad world (challenging!).
9	Dissemination, attractive and clear homepage, simple and understandable documentation, plenty of examples, usable API.
10	Running examples that show the power and developers can download, reproduce and test themselves. Good documentation of APIs. Easy to use APIs. Clear explanation of why universAAL is something good as well. Support (if possible online, or with short time response)
11	Attention and continuing updating
12	* Several usability grades: easy for simple UI designs, but open to use more difficult interactions if needed; *One UI with support for different platforms and interaction options; *Easy adoptable with modules (if a user needs a new service module, the User Interface must make this possible without a software update for the presentation module)
13	Good, stable, unified components portable across different platforms.
14	Perfect fit with requirements; avoiding pitfall of wanting to do too much
15	Support by developers even after project end
16	Friendliness, interoperability
17	Adopters outside the project. Ensure that simple things are simple to do

18	It should be open to as many different platforms as possible
19	making it known by best practise examples
20	Easy to use; Similar to existing programming languages. methods; Intuitive; Easily adjustable to specific needs
21	Lots of luck!
22	Real applications and many users. There needs to be a critical mass, and a clear benefit for users who provide feedback. Just "oh, thanks for your time" without any other "goodie" will not be sufficient.
23	A big user community, providing support to the new users. The creation of guiding material for the use of the middleware, first in English and later on in other languages.
24	Proper documentation.
25	I think that it will be necessary to promote it as a potential standard, so that all applications developer would use it for their developments

Table 39 List of answers to the question on what is needed to make AALuis a long lasting widely known Open Source project

	<i>Reasons</i>
1	goede rapportage / analyse mogelijkheden (gute Analysemöglichkeiten)
2	* trend analysis
3	A nutritional service with shopping list
4	Health risk management.
5	some kind of well-being diary for self-monitoring health parameters and sending reports to health professionals if needed
6	calendar, medication service, local services (bakery, meals etc.)
7	guide- and general information services; language-services
8	A graphic designer which is technology independent. That would be wonderful! You design once and deploy on Android, iPads, PCs, etc..
9	If you mean UI services by AALuis, maybe multimodal interaction. It seems it only provides graphical support. If you mean AAL services by my company, for instance: Fall detection, activity monitoring, and control of devices...
10	Evolution support as the user ages. Capacity for the end user using AALUIS interfaces to give feedback and be considered.
11	If we HAVE to use it because everybody else does we will use it. If there is an obvious, tremendous benefit in using it we will use it. At the moment it is one piece of technology among many others. We cannot try all of them. Our toolset is complete, as far as we feel; we will only add things if we feel an acute need. This is not the case. If we want to interact with users we meet them. Eye to eye contact has proven to be most useful for many reasons.
12	Die Notrufapplikation müsste technisch viel einfacher integriert werden können. Die befindet sich technologisch aber noch in der Steinzeit.
13	*Das Finanzierungssystem des Bundeslandes; *Die öffentliche Einstellung zum Thema; Telemedizin/Telecare; *Mehr Bedarf, (noch) weniger Pflegekräfte - dann steigt die Akzeptanz aufgrund mangelnder Alternativen.
14	Schulungen im medizinischen Bereich. Bereitschaft der Organisationen, z.B. Hilfswerk oder

	Hauskrankenpflege, mit unserer Organisation- Seniorenbund -zusammenzuarbeiten
15	Diese Art der Betreuung gehört nicht zu unseren Aufgaben
16	Generell ist das sicher eine gute Idee. Nur für unsere Organisation sind diese Feature nicht von belangen.
17	Systeme einfacher für die alten Menschen, die kommen zum größten Teil nicht einmal mit einem Handy klar
18	diese Befragung besser gestalten, man kommt sich dabei vor, für dumm verkauft zu werden, weniger Unstimmigkeiten und Fehler in der Befragung, bessere Auswahl der Stichprobe für die Befragung, ich bin beispielsweise für Bildung in der Pflegezuständig und habe nicht direkt mit KlientInnen zu tun
19	Unsere Dienstleistung beschränkt sich nicht nur auf technische Kontrollen sondern beinhaltet den persönlichen Kontakt, Kommunikation und Beziehung zum Menschen. Körperliche Werte müssen vom Arzt beobachtet werden. Wir machen Körperpflege, Essen, Kommunikation, häusliche Ordnung.

Table 40 Reasons of the statement that the participants' organisation could not benefit from AALuis in general and suggestions for improvement of AALuis.

	<i>Reasons</i>
1	uitbreiding van de dienstverlening (Verbreitung der Dienstleistung)
2	Offering our clients (prof. caretaker) new possibilities to offer their care more cost efficient en still personal.
3	Probably by implementing it as a tool for Customer Service dept...And maybe also for Monitoring dept.
4	This is very forward thinking. I am interested in the concept. Sadly, many of our clients do not have access to the internet.
5	We are developing in the coming period different kind of online services to our clients. Integrating will be an issue in the coming phase. It would be helpful to learn from other organisations how they deal with AALuis and what are the real benefits.
6	By providing a free middleware we can use for developing new services
7	saving time and money for the adaptation of existing UIs for services to different (new) devices
8	I think this question is obsolete here.
9	- Keeping track anywhere of a multitude of passwords and codes
10	See comment for the previous scenario. Nothing to add.
11	We develop AAL applications and especially user interfaces. Most of platforms and middlewares are limited now in terms of look and feel (the results are simply ugly). A good tool should give a high level of personalization and take into account the latest techniques of UI like for mobile phones and tablets.
12	In summary, saving time while developing and relying in something that is done for the oy of elderly people and for the use of programmers.
13	We are not currently involved in UI design and build, but other companies in our product design cycle could benefit. It would ease probably shorten their development cycle
14	Lower development costs; Better user interface quality
15	serve as basis for further developments
16	Creating and adjusting UI

- 17 Probably faster development
- 18 We planned a cooperative project using AALuis
- 19 We work a lot with motor disabled people. For us is important to make services and software accessible to them.
- 20 Using AALUIS middleware in order to speed up the development of UI oriented to people with reduced eyesight
- 21 To build user interfaces for research projects.
- 22 Will help the integration and adaptation of diverse services, contents and UIs
- 23 attraktiveres Angebot für die Kunden
- 24 wir würden mehr Leistung anbieten können. Auch für externe
- 25 durch Nutzung neuer Medien würden Angebote der Organisation (Bsp. Seniorenausflüge, Essen auf Rädern) den Kunden direkt und zeitnah erreichen.
Auch wenn kein direkter Kontakt zwischen Mitarbeiter und Kunde besteht, bleibt die Organisation durch die Bereitstellung des Angebotes stets präsent.
- 26 Erweiterung des Kundenkreises.; Unmittelbaren und ständigen Kontakt zum Kunden
Erkennen von Bedürfnissen des Kunden und unmittelbare Vermittlung weiterer Dienstleistungen
- 27 Interaktion mit Nutzer; Einsatz Ressourcen
- 28 Indirekt, wenn damit ein Beitrag zur gesundheitsbezogenen Versorgung geleistet werden kann. Für Innovationen, die Investitionen (von wem immer) erfordern, müssen die finanziellen Rahmenbedingungen vorab geklärt werden. Die Szenarien scheinen sich eher auf eine finanziell besser gestellte Zielgruppe zu beziehen und sind daher nicht massentauglich.
- 29 Entlastung des Pflegepersonals
- 30 Neue Dienstleistungsangebote, Service und Begleitung
- 31 Für alle älteren Personen in unser Dorfgemeinschaft die Möglichkeit zu geben, durch diesen Dienst ein längeres selbstbestimmtes Leben zu Hause zu führen, um vielfach dadurch länger ohne Pflegeheime und krankenhaushähnliche Heime auszukommen. Dadurch könnten Kosten der öffentlichen Hand verringert werden
- 32 Optimale Überwachung des Gesundheitszustandes.
- 33 Im Rahmen des Seniorenbundes könnten die beschriebenen Anwendungen zentral eingesetzt und bearbeitet werden (Von den Ortsstellen Meldung von bedürftigen Personen an die Landesorganisation, von dort aus Koordination unter Mithilfe der örtlichen Funktionäre)
- 34 Unterstützung des Mobilen Dienstes, der die Selbständigkeit von KlientInnen möglichst lange unterstützt. Aber auch für Betreutes Wohnen als Unterstützung einer WohnbetreuerIn möglich, die dann nicht mehr wegen jeder kleinen Dienstleistung persönlich bei BewohnerInnen nachschauen müsste. Z.B. um die BewohnerInnen ans regelmäßige Trinken zu erinnern.
- 35 Weniger organisatorischer Aufwand -> Einsparung von Kosten
- 36 automatisierte Abläufe
- 37 Fachkräfte könnten mehr Zeit für die Betreuung der Personen nutzen, da die Tätigkeiten wie Messungen der Vitalzeichen und Weitergabe an den Arzt wegfällt.
Unabhängiger in der Betreuungszeit, bessere Koordination der Fahrtstrecken da es weniger zeitliche verpflichtende Einsätze gibt.
- 38 Entwicklung von einzelnen Modulen, die sich finanziell tragbar für den Massenmarkt darstellen lassen. Die Geräte müssen einfach zu bedienen sein.

39	müsste ausreichend getestet werden. Sinnvoller Projektstatus inklusive Projektfinanzierung; Könnte Personalknappheit in bestimmten Berufsgruppen erleichtern
40	Geld- und Zeitersparnis
41	Serviceverbesserung für Kunden dadurch extra Einnahmen
42	Es könnte besserer Service mit weniger Personal geboten werden
43	Kostenreduktion, Zeitersparnis
44	Gewinnung von Neukunden

Table 41 Reasons of the statement that the participants' organisation could benefit from AALuis in general and suggestions for improvement of AALuis.

<i>Suggestions for additional services</i>	
1	Please provide me an email address to send my ideas by email.
2	user acceptance tests of user interface stylesheets
3	I think that some sort of rating or strong guidelines for developers of Apps based on AALuis is necessary, so that quality can be provided.
4	rating and feedback
5	Technical support and updates
6	Simulators and generic test cases
7	Apply the system to different languages and diets, Concentrate on getting this service on the market before getting into other challenges
8	Simplified development tools (example: visual development tools)
9	User community with discussion blog
10	Simple to work with and rich configuration settings
11	Hard to say. In my mind a Skype like connection would be good, so that you can talk things over.
12	Some kind of framework for developing the UI according to AALuis middleware
13	Agenda option, healthcare advice, exercise tracking
14	* Medication reminder services; * promotion of appealing activities for elderly living at home (so that they're reminded of other things to do instead of watching TV), * fitness exercises (in order to promote physical exercises for elderly); etc.
15	erhöhte Aktivierung der Endnutzer
16	Essen & Einkaufsservice
17	Telefonischer Service zur Medikamenten-Einnahme. Telefonchat für Senioren
18	Grundsätzlich finde ich die Idee, Menschen, die wie in Ihrem Beispielszenario im Alter von Einsamkeit bedroht sind, zusammenzuführen, großartig! Dies gekoppelt mit täglich neuen Angeboten und Vorschlägen der Organisation, die auf den jeweiligen Kunden individuell zugeschnitten sind, bildet meiner Ansicht nach ein optimales Mittel der Kundenbetreuung.
19	Pflege; Menüservice; Häusliche Dienstleistungen; Lieferservice von Waren durch Kooperationspartner;

	Angebote von Kooperationspartner aus der unmittelbaren Umgebung des Teilnehmers.
20	Bereitstellung von Informationen (Gesundheit), Tips, News, Angebote dazu etc.
21	Leistbare und massentaugliche eHealth-Services, denen benutzeradäquate Interfaces für diese Services bereitgestellt werden.
22	Sturzüberwachung
23	Bestellservice, Spiele, Kommunikation mit Freunden/Kindern, Vorlesen von Büchern usw.
24	vielseitigere Nutzung für Endnutzer (ein Gerät für viele Dinge) Kommunikation; Notruf
25	Miteinbeziehung von Angehörigen. Nutzen für Anwender in Zusammenhang mit Alltagsbewältigung klar herausarbeiten und darstellen
26	Begleitservice zu verschiedenen Gängen, Begleitung zu Seniorenveranstaltungen, Karten- oder Brettspiele, Beratung für Hilfsmittel, z.B. Hörgeräte, Beratung in rechtlichen und sozialen Belangen.
27	Einkaufsdienste Apothekendienste usw., dadurch könnten alleinstehenden, gebrechlichen "alten" Mitbürgern und bei Ausnahmen auch jüngere Personen geholfen werden
28	Organisation von Essen auf Rädern auch in kleineren Ortschaften. Zusammenfassend: Erinnern ans Trinken; Zentrale Erfassung der Vitaldaten; Erinnern an Medikamenteneinnahme; Eventuell im Betreuten Wohnen: Anlegen einer nutzerspezifischen Einkaufsliste um den Einkauf, der oft von der WohnbetreuerIn vorgenommen wird, zu vereinfachen (oft bleiben bestimmten Artikel immer gleich, sind aber individuell verschieden. Z.B. bei einer Bewohnerin ist es alle 2 Wochen die Marillenmarmelade, weil sie jeden Morgen Marmeladenbrot isst; vlt. wäre auch eine Berechnung des Verbrauchs und dann schon vorab eine Erinnerung, dass ein bestimmtes Lebensmittel bald ausgeht, möglich). Vlt. könnte hier auch mit einer Supermarktkette zusammengearbeitet werden, bzw. mit einer Filiale, wo eine solche Einkaufsliste hingemailt würde - Zustellung
29	
30	Notruftaste
31	Unterstützung bei Kontaktaufnahme, Telefon; Rückfragemöglichkeit für Angehörige, ob alles OK ist.
32	tägliche Nachrichten um den persönlichen Orientierungsverlust zu verhindern, kognitive Aufgaben zur Tagesbewältigung – pers. Tagebuch, Terminerinnerungen, Kochbuch - Ideen zur gesunden Lebensführung im Alter, geistige Anregung zur Prävention - Spaziergang in der frischen Luft (förderlich für die Psyche, Kreislauf, Motorik, Erhalt von Muskel- und Knochen, soziale Leben - Motivation und Sinn geben).
33	Entwicklung von Sensoren zu Absicherung von Wohnungen im Fall von Demenz Hinläuferschutz (Verlassen der Wohnung) im Fall von Demenz Entwicklung eines Hausnotrufapps für das Smartphone im Kombination mit einem Funkfinger, der über weitere Sensoren Vitalfunktion erfassen kann.
34	Signale bei möglichen Gefahren (Rauch, Kälte etc.) Service in Verbindung mit Haustieren, die die Kundin/der Kunde hält Installierung von Kameras in der Wohnung, die - auf Wunsch der Kundin/des Kunden - eine Verbindung zur Abwicklung bestimmter Services darstellen (Physiotherapeutische Übungen).
35	Videokonferenz zw. Klient und Betreuer
36	Gewichtsmessung
37	Technische Unterstützung bei der Suche nach dementen Menschen die sich aus ihrer gewohnten

	Umgebung entfernt haben (Stichwort Desorientiertensystem).
38	Pflegedokumentation elektronisch erfassen und auswerten bzw. für Kunden auch an andere Einrichtungen weiterreichen.
39	alles rund um den Haushalt (E-Herd, Wasser), Überwachung wo die Person sich aufhält bzw. ob sie das Haus verlässt (Demenz).
40	Versorgung mit Alltagsgütern (Anbindung Apotheke, Lebensmittelhändler etc.), E-Mail und Kalenderfunktion, Anbindung an Essen auf Rädern, Sturzsensoren, Notruf und Ortungssystem, Energiemanagement, Telefonie.
41	ev. sonstige Alltagsabläufe für Pfleglinge und Angehörige katalogisieren und individuell anordnen, um mehr Pflegeeffektivität im Einzelfall zu erreichen!
42	Bewegungsmelder, Sensoren im Kühlschrank und Herd oder Türschloss und Beleuchtung
43	Hilfestellung in allen erdenklichen Lagen, von Erinnerungen an das Zähneputzen bis hin zur Vollsteuerung des Hauses (Heizung/Wasser/Strom) Das Problem ist immer die Finanzierung all dieser Dinge.

Table 42 List of suggestions of additional services for AALuis