



Project FoSIBLE
Fostering Social Interactions for a Better Life of the Elderly



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1. Introduction

According to the World Health Organization¹, the proportion of people age 60 and over worldwide is growing faster than any other age group. A primary concern for this population is the loss of companionship, which can contribute to isolation, depression, decreased socialization and may have negative impacts on the general health status. Our research aims at bridging spaces to foster social interactions and experiences for older people by acknowledging the diversity of life worlds, needs, preferences and interests. Our aim is to increase the well-being and the self-esteem of elder people by filling in their loss of companionship and entertainment.

We identify two major challenges in designing interactive social support systems: designing really innovative applications and devices for effective social support practices, and designing these services for a medium which would be more affordable for older people than computers, and which could then be well integrated in the everyday life. Our idea is then to choose the TV-based media center (a term for technology that supports communication and interaction in the context of the television infrastructure) and game console technology as it evolves around the television set which is well known and frequently used by elderly people. Integrating user interfaces into the environment will help people to intuitively and naturally interact with the TV/computer/network. In this context we sight another research gap concerning input/output devices which until today, only scarcely are designed to support emotional or immersive communication.

The idea to use TV-based media center and game consoles as a medium for the communication services is related to the research field of Social TV. Several social television systems have been developed (we can quote CollaboraTV, AmigoTV, ConnetTV, Media Center Buddies, Telebuddies, Find-a-Friend, Living@Room, Tribler, ChaTV, 2BeOn, Zoost). They can integrate voice communication, text chat, presence and context awareness, TV recommendations, ratings or video-conferencing with the TV set. But as yet they are still on a conceptual stage, or exist as lab prototypes, beta or pilot versions. We can find recent syntheses of the functionality of these systems and their assessment in (Harboe et al. 2008, Mantzari, Lekakos, & Vrechopoulos, 2008, Nathan et al. 2008). Although there has been considerable investigation of particular social television elements, no comprehensive field studies have been conducted on the usability, impact, and potential adoption of full systems, nor have particular needs of elderly been in focus of related technology design research.

Methods for taking into account the usability issue when designing social TV applications do not really exist for the moment. We can find several guides and excellent

¹ <http://www.who.int/topics/ageing/en/>

ergonomic guidelines to support the design of interfaces for the elderly and to help developers in building applications for interactive television (e.g., the work from Morrell or Zaphiris et al. quoted in (Dickinson, Arnott & Prior, 2007), (Carmichael, 1999). The use of these guides provides a real added value in terms of accessibility, however it does not reflect the real needs of the future users and does not encourage sharing and collaboration among different stakeholders. Thus, designers do not have any tool allowing them to focus on the social aspects of interactive television applications, even if there is recent research that attempts to provide answers to this issue, including (Geerts, 2009), who introduced heuristics to support the social practices through interactive television services.

The perception of the needs of elderly people, who usually have limited experience with information technology and communication, raises special issues. The fact of not involving them in the early stages of the design process may lead to reluctance on the use and adoption of the designed technologies and devices. It is therefore essential for researchers and developers to have effective methods to interact with elderly people and to collect data on their needs.

According to (Eisma et al., 2004), traditional methods of user-centered design need to be adjusted if we want to enable researchers to effectively gather the requirements of the elderly. A participatory design approach specifically aimed for older users that focus on collaboration with future users throughout the process of design and development is the most appropriate for our project. Participatory design reflects a change in attitude from design for users to design with users. It is a participatory experience that represents a state of mind and a belief that all individuals have something to offer in the design process and they can be expressive and creative when they were given the proper tools (Sanders, 2002).

At the end of these introductory points, we would like to outline the rest of the deliverable sections: Section 2 (Objectives) defines our objectives for this deliverable building on the introductory state of art (this section). In Section 3 (Methodology and settings) we explain user sampling and how interviews were done in all three participating countries; Section 4 (User requirements) is where cumulative empirical results are presented from all three countries in form of adequate result synthesis and design implications. Section 5 (Synthesis and design implication) presents synthesis of empirical results and design implications; In parallel to interviews, we developed preliminary scenarios presented in Appendix 1 (Preliminary scenarios) which were evolving with our understanding of end-users. Final consolidated scenarios using the functionalities of developed prototype and design reasoning behind it can be found in the D2.2.

2. Objectives

In order to be able to design solutions which will be usable and useful for the end-users, and then ready for the market, we need to clearly understand the specific situations of elderly people. Firstly, we need to understand their daily practices, how do they live, what are their actual interactions and communication modes and exploring in what areas of their life digital technology bring a meaningful contribution. Then, we need to focus on their needs in terms of information and communication, taking into account their abilities to interact with specific devices and technologies. The establishment of an integrated design approach taking into account the needs of elderly and exploring the social dimension of TV would allow to determinate how television technology can become a resource for the sociability among older people.

Existing systems of SocialTV do not provide elderly people an interface and features tailored to their needs and their age-related difficulties (decreased vision, hearing, manual, and cognitive dexterity) and related socio-cultural barriers to ICT. To motivate them to adopt this technology which could help them maintaining and strengthening social ties, we must first think about how to make it more attractive and usable by taking into account their particularities and difficulties to use display and control interfaces as well as understanding specific attitudes towards ICT use.

3. Methodology and settings

3.1 Selection of the research methodology

Due to the exploratory nature of the requirements elicitation phase a qualitative multi-method approach (Flick, 2009; Randall & Rouncefield, 2007) has been chosen. The set of methods contains semi-structured and explorative interviews, participant observation, workshops, and socio-technical measures for preparing a living lab roll-out to real households in the later evaluation project phase.

The qualitative multi method approach has been chosen for several reasons:

- We know from telemedicine projects in the AAL field that a lack of integration of user perspectives into the projects is virulent which leads to a lack of knowledge in how elderly users integrate ambient technologies in their actual every-day life. Especially questions such as how the technology will impact their daily lives, their willingness to embrace this technology and their related views and concerns are widely ignored (Beringer, et al. 2011; Demiris et al., 2004; Mahmood et al., 2008). Methodological shortcomings on the AAL R&D are being reported, e.g. by Ekeland et al. 2012, in, among others, pointing at an undeveloped but needed use of qualitative studies for the above mentioned reasons.
- The focus of the project lies in the identification and subsequent ICT support of elderly peoples' needs towards social interaction and societal inclusion for improving the conditions of aging at home. However, it is not fully clear, in technical terms, what we imply by the notion of 'the user', especially when facing the diverse societal group of elderly people. This is, we have to deal with an extremely diverse range of people whose needs are as differentiated and complex rather than we can look at the prospective ICT users as a fixed group With clear-cut and predictable characteristics (see e.g. Suchman, 2007).
- This point of view in user-centered design implies that both ICT and processes of adoption and appropriation of ICTs are mutually socially constructed and underlay a continuous process of negotiation in specific contexts of use.
- Reflective research methods which also include a perspective on the user-designer relationship are therefore needed to gain both a thorough understanding of the field of research and an understanding of appropriate methods to bring new ICTs in the field of interest, such as the Living Lab Methodology which will fully be rolled out in the second project phase.
- By this, research process was conceptualized on learning process between researchers/developers and user research participants by means of an exploratory research design based on qualitative methods, which allow for an ongoing process of data collection, analysis, interpretation and prototype development.

3.2 Sample Selection

3.2.1 Germany

The empirical design process started with a reflection on how elderly people live and typically organize their social life in all three countries. The focus was set on questions such as if there are typical organizational forms of socializing or ways of seeking help by elderly people in the different countries. In Germany, a combination of convenience sampling and snowball sampling was used. Convenience sampling has been seen as a legitimate sampling strategy in our case due to the difficulty to find older adults being interested in participating in an ICT research project for the whole project duration. As it was required to involve end-users as fast as possible, we first accomplished a broader pre-study with 20 elderly people living in different circumstances – on their own, in service apartments as well as in a retirement home. After the 20 preliminary interviews at the very beginning of the project we were confronted with several problems: albeit we could derive some substantive results for a first user requirements definition we were confronted with a general low affinity and interest in new media use by the persons of that sample which would make it nearly impossible to install a long-during participation over the three year project period. In addition, after these first experiences, we noticed that it would be a prerequisite for a positive project outcome, to aim at finding a network of people who interact in their leisure time so that in a later phase prototype testing for social interaction applications will be set up in a realistic setting in which people are willing to use and test the technology.

As elderly people in Germany often spend their time in associations where they are socially linked to other people, such as sports associations, artwork, church groups, or holding honorary posts in community activities, we were trying to get access to suchlike groups in a second sampling phase.

After several meetings with different representatives of associations in the region the association “AlterAktiv” with its subgroup “Senec@afe” has been chosen for cooperation. An important reason for this choice is, that we have access to elderly people who have a certain interest for new media topics – which we see as a prerequisite for an ongoing and intensive cooperation – but the broadband of individual access and competences towards new media is very high, i.e. we have access to both seniors, classical so-called “n-onliners” who try their first steps with smartphones or PCs, and some advanced PC users. The “senec@fe” is being moderated by 10 seniors who pass their knowledge in the realm of PC usage to visitors of the café. Many elderly club members are more interested in the social exchange than in actual media topics and often rather come for a chat around the coffee table instead of working in front of the PC. Regarding the health status the members of the “senec@fe” are equally diverse. All are retired and their age ranges between 65 and 80 years. Some of them have very good health conditions; others suffer from age-related diseases which impact on their mobility and seeing/hearing ability.

3.2.2 France

For the selection of 10 potential end-users in France we organized a first meeting with the help of our partnership "Les Arcades", a gerontology prevention centre financed by the Malakoff Médéric group which is one of the biggest players in complementary medical insurance in France). It took place on June 30, 2010 in the conference room of Les Arcades, in Troyes. The project was presented to more than 50 retired persons living alone. The involvement of the end-users is based on voluntary participation and the selection was made upon their age and familial situation.

The participants received an invitation letter from Les Arcades, announcing the purpose of the FoSIBLE project. During this meeting, we presented the project and asked who would like to participate and join the project. Two brochures were made for this occasion and given to the participants. One gives a general overview of the project and the other includes a set of usage scenarios of social television, so that participants can get an idea on some potential opportunities for using the system that we intend to design. We had a positive return from the audience. Following our first information meeting, 5 candidates from the 20 have volunteered to participate in the project (four women and one man). For our semi-structured interviews we were able to meet only the women, the man went on holiday and we had arranged to meet him in September, as well we organized a second information meeting with 30 participants in the same period to recruit the 5 remaining members.

The selected participants are 8 women and 2 men aged between 65 and 90 years and showing no apparent health problems that prevent them from leaving or being in contact with their friends and family. They do not have any autonomy problems now but are interested in defining services which could be helpful for the future. None of them are really experienced with ICT.

3.2.3 Austria

For the recruitment of interview partners and workshop participants in Austria we used the test person database of CURE. With around 1800 entries that change partly on a frequent basis the variety of registered persons interested in supporting studies is high enough to match the criteria for the FoSIBLE requirements phase. These criteria were: aged between 60 and 80, still active in social activities, participation in some kind of organization or clubs, no severe health problems and no need for professional help. In order to investigate user needs we wanted to ask 10 elderly persons about their living circumstances, media usage and social interaction. After the creation of accordant scenarios we wanted to discuss if they match their expectations, if they find the depicted situations realistic and how we could improve them towards more realistic scenarios. For this discussion we invited two times 10 persons matching the mentioned recruitment criteria.

3.3 Data collection and analysis

3.3.1 Germany

A qualitative research paradigm implies that analysis starts early with sample selection and before a structured data collection. Insofar several sources of data are aggregated and being used as a basis for analysis. In the following we report on different steps of data collection:

- **Semi-structured interviews:** In the first sampling phase we accomplished 20 interviews with people aged between 72 and 96 years. Each interview lasted between 60 to 120 minutes and was audio-taped. The interviews were accomplished in a semi-standardized procedure, i.e. structured by an interview grid which has been developed according to the common and mentioned core research themes. The interviewees were living in different circumstances – on their own, in service apartments as well as in a retirement home.

The first 15 interviews were taken at the very beginning of the study in the interviewees' homes with the aim to gain knowledge of the living situation and current media use. Later we accomplished additional 5 interviews in a retirement home after an internet workshop to extend the ideas for design. On the occasion of an „Internet Day“ at the retirement home near Siegen, on which we showed the inhabitants different internet technologies (YouTube, Facebook, Skype, ZDF Mediathek), we did the interviews about inhabitants' impressions. We wanted to explore which content they liked or disliked and why.

In the next phase, some people from the „AlterAktiv“ club allowed us to visit them in their homes for an interview. We accomplished next 15 semi-structured interviews in 12 households, with both, people who live on their own (mainly widowed) or with their spouses. The interviews were accomplished on basis of a questionnaire. Experiences of the first sampling and the contact period were used in the construction of the questionnaire and it has been subsequently complemented after each interview when it was necessary to include new perspectives which had been learned in former interviews. The interview duration varied between 60 and 120 minutes, permission for audio-recording had been given by all interviewees.

All interviews were transcribed verbatim and analyzed using software for qualitative data analysis (MaxQDA). In the analysis commonalities and uniqueness within and across interviews were identified in an ongoing coding process based on the principles of Grounded Theory (Strauss & Corbin 1990). The coding process was an ongoing categorizing and sorting of data in order to develop conceptual categories from the data. The analysis identified themes that represented salient phenomena in the context of accomplishment of every-day life and attitudes, concerns and reflections on potential ICT support. This process was continued until a level of theoretical saturation was reached when new interviews added relatively little new knowledge.

- **Informal Chats/Presentation sessions (with AlterAktiv):** Before acquiring the willingness of individual seniors for an interview we had to present the project ideas and goals several times to the members of the association. Even for active ICT users the FoSIBLE ideas seemed very far away from their actual everyday life. They asked us three times to come over and present our project ideas and goals and asked us for reflection sessions. By this, our first contacts in the club aimed at both, acquisition of interested elderly people as research participants and serving as trigger for discussion about the participants' views, attitudes and concerns towards AAL technology aiming at fostering social interaction.
- **Participant observation (with AlterAktiv):** One or more research team members regularly took part in the club meetings (every 2-3 weeks over several months) in order to observe social interactions between club members, occurring themes and topics and how the members use and learn PC programs and themes. Field notes have been taken during and after the participant observation sessions which in turn were added to the data basis.
- **AlterAktiv club as a first Living Lab:** In a later project stage the club room has been equipped with a large screen TV, a set-top box and 4 smartphones have been handed to club members. This was an important measure to help the club members in their reflection of prospective iTV-based ICT for social interaction. Participant researchers were then also contact persons for reflection on the ongoing process. This process step has been proved extremely helpful in lowering the participants' barriers and concerns towards the prospective roll-out of the technology in some of the participants' real households (later phase). By this, they were able to test the devices in a "secure" environment together with people they trust. Another outcome of this measure is the trust-building process between the club members and the researchers.
- **Continuous interaction between club members and researchers (with AlterAktiv):** Regarding the importance of trust-building two other issues also serve as data collection opportunities: In order to provide some form of reciprocity among club members and researchers the club members have been invited to the university as they communicated their interest to learn about the work contexts of researchers. Arising chats and discussions again contributed to the data basis in form of written notes after the session. Another data source is the collection of emails and telephone call notes from club members concerning questions and remarks on technology usage given to the club. The empirical analysis served in a next step for the development of consolidated scenarios and personas.

3.3.2 France

To understand the needs and expectations of our future end-users, semi-structured interviews were tailored in accordance to the interview grid. The grid was not used as a planning tool for conducting the interview but as a reminder that the primary function is to reassure the interviewee. It acts like a support tool during the interviews to check that all topics were discussed. It was proved to be useful for remembering specific formulations of questions.

For the interviews we went to participants' residences. It was an opportunity to observe the environment in which they live, which allowed us to locate them socially in their environment. The interviews lasted on average 90 minutes for each interviewee and had aim to trace switching between working life and retirement and determine social changes in their lives. In better words, to understand participant's daily life activities like: what activities do they perform and how (collectively or individual); what are their actual interaction and communication means with friends and family; in what areas of their life digital technology could bring a meaningful contribution taking into account their abilities to interact with specific devices and technologies.

We asked permission to record the interviews in order to be able to be more attentive, and to create a link with our interviewees. Before the end, we made sure that each interviewee had said everything that they have to tell and that no questions remained. We explained the next steps of the project and our expectations for next appointments (group discussion, prototyping, testing social applications). In later stage, focus groups were organized. There, the participants could speak freely about the system during a session lasting about two hours. The objective was to collect data on how users perceive the system, and therefore to obtain their feedbacks, initial reactions to the design and to examine their preferences.

3.3.3 Austria

In Austria, ten interviews were conducted at the end of August 2010 at the laboratories of CURE. We interviewed nine women and one man from age 61 to age 75. At the beginning of the interview we presented the project and its aims and handed out an information flyer and an informed consent. All participants were members of different clubs or organizations liked demanded in the recruitment criteria. All participants but one woman had children and grandchildren. Mean duration of the interviews was 45 minutes for each interviewee. At the end of the interview we announced that workshops or group discussions will follow within the project and asked for their permission to contact them again. All participants were interested to participate in future studies of the project. Within two workshops in November of 2010, each with ten participants, the preliminary scenarios had been assessed by the elderly. During these idea generation workshops new input for refining and extending the existing scenarios has been created.

4. User requirements

4.1 Understanding situation

4.1.1 Germany

Elderly and Their Own Situation

As the living contexts of our interviewees vary in a broad extend – from the independent “younger old” to elderly people moved to service apartments or a retirement home – so do other factors, too, such as individual social networks, hobbies, technology/internet affinity and health status.

The majority of interviewees have more or less strong familial ties, especially to their children and grand-children. However, in some cases there is an asymmetry in respect to the wish of the interviewees regarding interactions with their families and their respect for their busy lives which lets them hesitate in contacting their children too often.

Regarding health condition, some of the interviewees in service apartment and retirement house context report on health problems which have impacts on their actual mobility radius, i.e. due to different health problems interviewees experience a reduced mobility. In contrast, interviewees from AlterAktiv mainly are mobile and independent in their daily activities. However, age-related health degeneration, such as reduced seeing and hearing abilities are also common among the younger old.

One interviewee, whose language faculty has been affected by an apoplectic stroke, feels that reading is too exhausting for her; she likes following the news where both local and global events interest her. Because of their impaired eyesight, many interviewees are very grateful to receive help in the form of larger font sizes. Despite their affliction, many of the interviewees try to stay independent as long as possible and do not want to be a burden to others.

Among the interviewees in retirement home and service living, there are some people who, due to their medical condition, had to either give up their old hobbies completely or were only able to exercise them less often. Among these hobbies are mainly sports, but handiworks or musical instruments are also among those activities which become increasingly difficult with old age. Among the AlterAktiv interviewees hobbies and leisure activities are widespread, however some report, that social networks and friendships with the entrance of the retirement were broken up and by this, some of the hobbies and activities. Even for the younger old it is often a problem to build up new social networks and friendships.

All AlterAktiv interviewees have interests – in varying extents – in learning about new media and the internet and participate in different extents in club meetings, which are

offered three times a week. For some of them the social activities overweight the technological topics for motivation to participate. There exist many diffuse fears in respect to safety and privacy concerns, but also in respect to negative consequences in media usage for personal relationships and everyday experiences. However, on the other hand, there is a strong motivation to learn and be informed about new ways of using media. However, when fears exceed perceived actual benefits in media use, people stop the usage rather quickly.

Elderly and Social Interaction

Our studies on social interaction of elderly elicit new viewpoints. The social interactions of the interviewees differ in strong dependence to their living situation. Residents of retirement centres and service apartments often meet for group offers of the respective facility. Outside of their apartment and the retirement centre some of the interviewees state to be members of associations or to attend other regular events, such as do nearly all of the younger old interviewees. Among them are sports facilities, gymnastics club, literature circles and church groups, singing group, volunteering, and the visits to the senec@fé in case of the AlterAktiv interviewees. Furthermore, most interviewees keep in touch with their families. The most used media to stay in contact with family and friends are phone and email. Sometimes video chat with relatives abroad is used.

All interviewees have in common that they have rather stable daily and weekly routines which give structure to their lives since retirement. To most of all routines seem of high importance, some even talk of “daily rituals” which they accomplish.

Elderly and Media Use

Commonly used media among interviewees in service apartments and retirement centre are television, newspapers and magazines. The radio is also present, while the Internet is only used by a few. Daily newspapers are regularly read by many such as also magazines and books being read regularly. To different extent, people are affected by visual impairments, then often complaining about not being able to read anymore saying that they prefer certain formats with short text passages or passages in large print.

Only a few people use the radio. Some seem to have used it earlier but have stopped using it partially because of problems with the operability of the device like for instance, keys that are too small. Some others let the radio run in the background especially in the mornings. Almost all of the interviewees watch television on a regular basis. Though for most of the time people deliberately chose and marked programmes in a TV guide beforehand. The preferred formats of the interviewees, apart from the news, span from movies to documentaries, quiz shows, and news shows. Most of them have routine

times for TV watching. Only two people are said to use the Internet. Here, one person makes use of online-banking and Ebay. In this case, the handling of computers had been acquired during their work time.

Mobile phone is almost only used for short calls when being absent from the home or taken with for cases of emergency.

For our interviewees from senec@fé the choice of different media is similar to the other interviewee group, only PC/Laptop usage must be added for this group.

Watching TV is – in contrast to former times – mostly an individual activity; even couples often use to watch TV separately from each other depending on their individual interests. Attitudes towards TV watching often are twofold and bipolar: on one hand, TV is often seen as “*a window to the world*”, on the other hand TV watching has an image of an activity of uneducated people where interviewees wish to distance themselves from. The respective utterances range from:

„We do not travel much, that’s why I like to watch reports on other countries”, or

“I only have an elementary school degree and I had to make up a lot in many things. The TV helped me a lot to expand my general knowledge” to some elderly people watch TV all day as they do not know what to do with themselves. “This is nothing for me, you cannot learn anything therefrom”.

When watching TV most of them are not using another medium at the same time. But there is a sequential usage of TV and Internet for instance if a link for further information is published in the news.

Regarding aspects of usability, the participants like to have separate remote controls for each device, as there is a clear focus of functions on each device. But some are irritated by the number of remote controls (namely it means they are irritated by the number of devices in the household). As an alternative, universal remote controls can be used to reduce the number of controlling devices, but we found out that all participants find it too complicated. The software customization of universal remote control requires high technical experience, which they don’t have (*“One has to study computer science to be able to set it up”*). The interface of remote control is not intuitive enough: Function-overload and unclear, not self-explaining labels and English terms are mainly named as barriers.

Results on PC/Laptop use show that all AlterAktiv interviewees use PC or Laptop, however in a very varying extend. Interests in PC/laptop use is related to the individual competence/knowledge level. Internet applications used serve mainly information and communication and for convenience purposes (e.g. Wikipedia, Email, Skype, online-banking etc.). Interviewees report a lot about PC/laptop related problems, such as:

Missing usability and perceived extremely high adoption barriers due to technical complexity, missing personal counseling and learning options, programs which are not intuitive. Some express the feeling of being *“thrown in at the deep end”*. The PC is *“too complicated and technically too challenging”* and *“It should be simplified, so that people are no more afraid of PCs”*. In addition, there are severe problems in using programs which are not in daily usage and which are lacking appropriation support. To re-learn the handling of such programs is being perceived as stressful and annoying. Another big hurdle is stated in the English language among the German interviewees. When facing problems the elderly often contact other persons from the club or from their social network, however the latter often with mixed feelings as they have fears of being perceived of embarrassing or a burden with their constant PC problems and questions.

4.1.2 France

Elderly and their Own Situation

The 10 participants interviewed in France have lost most of their friends. They are not isolated geographically and are autonomous in their daily activities. They remain very independent and active – one of them needs to walk 1.6 km to reach the bus station which leads her downtown. In terms of family and friends, even if most of them use the telephone to communicate, they do not feel isolated as long as they can travel to visit their families or to participate in group activities organized by Les Arcades: Roundtable discussions organized by the psychologist of the center, philosophy-coffee - a debate around a theme that aims to establishing a philosophical exchange in which everyone can speak, theater, yoga, annual travel, embroidery. Unfortunately, since this year all of these activities are no more organized by Les Arcades but by an independent association. This change affects the people we interviewed (for instance, the lunch is no more included in the activity), and as a result, they do not participate so often.

Other activities (not related to Les Arcades) are essentially related to doing volunteer work at the local parish (for persons who need help), going to the bridge club, attending plays and philharmonic concerts in Troyes, walking, gardening, shopping – which permits to discuss – attending computer class, or doing gymnastics with a physiotherapist. Their days at home are mostly organized the same way for most of our participants. They share their time between cleaning the house, reading, playing crosswords, codedwords, sudoku and especially watching TV programs by selecting them from a program guide or a magazine. They essentially watch news programs, medical programs, games, and movies in the evening. However, the time they spend affront television varies from one participant to another. Some of them watch television at specific times (noon for news, series), while others say they keep it on to have a kind of presence in the background even they are not watching it.

Elderly and Social Interaction

Our interviewed participants in the project said that following their retirement; they have hardly had any contact with their colleagues and even with their old friends which are either deceased or live in other cities. Today, their social network is limited to their families and for two of them to some friends. Besides one participant, others do not feel particularly alone. One of them even said that she enjoys some moments of solitude, especially because several of her children are in difficult social or professional situations, and depend on her for emotional and financial support.

Our participants receive regular visits from members of their families (mostly children) to help them for shopping, to do some work in the house (mowing the lawn, cleaning the gate), or to accompany them on journeys. One participant said that she depends on her children for trips that require a vehicle. Other participants had no contact with their neighbors, however one of them said that she knows she can count on them in case of problems or if she needs help.

The participants spend their free time outside and take part of the collective activities organized by Les Arcades. However, they do not maintain relationships with each other outside activities. One of the participants told us that she does not go there anymore because she did not find a social environment that suits her.

Elderly and Media Use

The phone still is the main communication medium they use. They mainly call their children, grandchildren and friends, especially when they cannot see them. All the participants evoke the lack of communication with to their grandchildren, and the fact that they miss sharing moments of their lives or seeing them growing. Two of our participants use e-mail and postal mail. They are also the only ones with a computer connected to Internet. Others do not intend to buy a computer for financial reasons. Computers are used to send emails to their relatives who are connected to the Internet, seeking information, viewing invoices, make accounts. One of them even sends electronic postal card to one of her friends. She likes this function but finds it a bit difficult to use. She also loves taking pictures but she finds it hard to understand how to share them with her friends and family.

Some of the interviewees use (or used) the VCR to record programs and movies on tape for later viewing. The transition to HDTV and the installation of a decoder has been problematic for two participants. The VCR is no more used with the new TV due to the new connection and the change in the configuration. Another participant with rheumatoid has also problems in terms of control. She has two remote controls, one for the TV and the other for the decoder, so some features suddenly become redundant (such as volume control for example which can be provided by the two remote controls). She has also difficulties due to her arthritis with pressing buttons that are too

small and with the confusion to select channel numbers with more than one digit. Others find no difficulty using the remote control. It must be said that they usually use it to turn the TV on and off and to change the channel. They do not use advanced features.

4.1.3 Austria

Elderly and their Own Situation

The sample in Austria was quite active. They have regular leisure activities such as short trips or journeys, museum and theater visits, sports or reading. Typical days of the participants are similar. All enjoy a relaxed breakfast, go for shopping, and meet with members of their social network. They end the day by watching newscast on TV and/or their favorite TV program such as entertainment in form of movies or series (e.g. comedy and crime), but also documentation and discussion formats.

Elderly and Social Interaction

Social contacts to family members and friends are regular and all participants had a good functioning social network including close family members such as children or grandchildren, and friends. Since all our participants were members in at least one club or organization, all participants also had contact to other members or even were responsible for active issues such as organizing events or trips. However, the majority had a quite passive membership and just participated in offers by the organization. The clubs include: local communities organizing trips and events, sport clubs, cultural clubs, language groups, and aid organizations.

Elderly and Media Use

All but two women had already computer experience from their last job. In terms of communication, most popular media is still the telephone or personal meeting. Even mobile phone is used less and only for short communication or when participants have to do a call outside of the home. Four participants use e-mail for communication purposes and 6 out of 10 participants used the internet at least once per week. Three participants do not use it at all. Since all the participants are still very active, TV plays quite a small role in their lives. Although it is common among them to watch TV in the evening, the average time of watching TV was 1.5 hours. Most participants also use teletext for information research. Asked if they could imagine communicating via TV, the participants were open for that especially if they had contacts abroad but also mentioned usability, privacy, and financial concerns. Further, they found the objectives of the project very interesting and were already curious about future involvement according to the project.

4.2 Synthesis and design implications

The interviews in all three countries revealed the picture of user requirements and provide us with some design implications either expressed by elderly or deduced by features they were expecting. Here we would like to summarize the findings.

During our interviews with the elderly project participants, we obtained a range of expressed needs in relation to the use of their TVs as a means of communicating and sharing information. These needs are more or less focusing on cooperative functions. Their first need was communication-oriented. Participants would appreciate to see their family and friends when they talk to them, especially when they have grandchildren, in order to see them evolve without leaving home. They would like the television to allow sharing real-life moments: grandchildren making them drawings, sharing comments during watching their favorite programs. For those who have friends at the retirement house, they would appreciate to communicate with them through television (as they say TV is the main occupation in the retirement house). The idea of communicating with other people than family or friends to discuss various topics (television programs, shared interests) seems also possible.

In terms of sharing, our participants also proposed some very interesting features that would be useful in their daily lives and would help them feel better:

- **Virtual guided tours on TV for cities and museums:** They would like to follow these virtual tours with others, and then being able to comment the visit. One said it could be nice to visit her hometown via TV with her grandchildren to show her where she grew up. She would like to annotate places and share feedback. She said she could then perhaps find old friends of her mother through this visit.
- **Attending courses** (computers, cooking, gardening, foreign languages ...): They would appreciate to learn things on television and to share their comments and impressions with others – for instance exchanging recipes during or after a cooking course. One participant also said being ready to meet new people, especially the other end-users of the project in Germany and Austria.
- **Attending sports sessions:** They would enjoy participating to dedicated and tailored sessions on television (e.g. yoga), and especially virtually attending to sessions at the same moment than their friends from Les Arcades.
- **Playing remotely games** (crosswords, sudoku, bridge): They would enjoy virtually sharing these games with their relatives and friends.
- **Sharing texts:** They would like to benefit from on-line poems written by one of their friends (with whom we have scheduled a meeting in September).
- **Online book club exchange:** They would like to exchange reading tips and to share advices.
- **Online round table**
- **Sharing a TV program**
- **Sharing films and television series available on demand**

Features have also been proposed like recording broadcasts or movies in order to share them afterwards, and searching for information. We also note that participants focus on

sharing and communicating about their activities rather than around the TV programs. Participants also expressed the need for a more accessible and less complicated interface than computers. About control interface, participants who do not have disabilities think using a keyboard would be possible but not very practical. They e.g. would prefer a digital tablet with digital pen, even if they find that the voice control is also a simpler interface than the keyboard. The digital control interface could be used for collective games as crosswords, puzzles or sudoku, and to exchange drawings with small children. For the participant suffering from arthritis, the digital tablet with digital pen is also difficult to use. She prefers to interact with the voice or using a remote control with touch screen or the television screen itself, which would be tactile.

The elderly people we talked with are widely interested in new technologies and are grateful for the opportunity to learn about them. A major problem for them to acquire the technologies is of financial aspect. But, dealing with actual technologies, media and content presented must be kept simple. Concepts and words we find easy to grasp may be completely unknown and too abstract for the earlier generations. There is an interest in individually adjusted contents.

For the interview partners who were not using internet in their daily practice, this offer was a fantastic way to arise the interest of the participants. Older TV series and radio plays, to which the elderly have no access via analogous media, were also demanded. They are also grateful about getting shown them internet applications, and they often expressed their reluctance to go “into the internet“. So we have to catch their attention and interest with content and (future) cooperative practices which seem of a benefit to them and not with the medium itself. Understanding the internet - or digital media at all - is quite hard, when you grew up with analogous media. They can hardly understand it and hear about the internet in analogue media like newspapers and adopt their wordings. This may be problematic as the internet is often seen more critically in the analogue media, because then some perceive it as a threat or at least a competitor. This has to be kept in mind, when talking with elderly people.

Another conceptual thought derived from the interviews is that content should not necessarily force the users to do something; rather some kind of automation should be considered. In our studies some of the interview partners expressed their concern that we would try to sell them something. As this is not the case and as this causes unrest and fear, such impression has to be avoided by all means.

Given mentioned requirements results in all three countries, we here summarize **design implications** by having in mind present technology possibilities and expressed user needs. Based on findings of the interview series in all countries we developed conceptual functionality ideas. In a next step we presented our ideas in workshops and in Germany in club visits at AlterAktiv/senecafé Living Lab due to their technological affinity and constructive brainstorming.

In addition after introducing the future hardware platform possibilities we hoped to broaden the view and at the same time get more concrete implications for the design. Results of this process are:

Design Implication for Interactive TV:

- A way to share TV program and stay in touch/communicate with buddies.
- Buddy-list which creates an awareness of the “others” and for sharing own opinions and experiences during a TV show.
- The buddy-list should contain a comment and recommendation function.
- An integrated knowledge-board organized by interests. If anyone has seen an interesting contribution, he could post and tag it. Thus, new communities of interest could arise which are able to build or expand their knowledge collaboratively. This also would contribute to the elderly's interest in displaying themselves as “integer” and knowledgeable persons (impression management issues).
- Knowledge-quiz: Since many participants like to watch news broadcasts and documentaries, one might give them the opportunity to put their knowledge to the test.
- Results in impression management issues suggest a careful consideration of privacy issues in the system.

Design Implication Derived from Experiences with Laptop/PC in Regard to System Development:

While the television was easily accepted in the homes many elderly felt unsure about the first PC acquisition. In order to lower the hindrances for the new system it should be advertised as entertainment system instead of highlighting the PC components:

- The services/ social activities should be more important in the communication than the system / software.
- The new system should be introduced with usage scenarios.
- The system should have interactive learning functionalities, e.g. on screen notifications, interactive guides.

Design Implication related to Usability Aspects:

- Universal controlling device is needed, but it should provide separate interface for each device.

- The software customization has to be intuitive enough, or maybe hardware customization is more suitable (e.g. remove unnecessary buttons physically from the remote control or even change the layout of the buttons).
- The controlling interface should only contain the functions that are needed. The icons should be self-explaining. The wordings should be in the native language.
- Users should be guided through the interaction process.
- The users should not need to reveal their private data (or too much of their private data) in order to use the system.
- The privacy settings should be clear and understandable

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Appendix 1. Preliminary scenarios

Rosa Lind is a 78-year old widow who is living on her own in her house in a small town. She is glad that she still can manage her every-day life mostly independently. Her biggest problem is joint pain due to arthritis in her arms, legs and hips which comes regularly. When an acute attack arises she is not able to leave her flat as the pain is too strong. In those cases she is happy that she has a nice neighbor who helps her with the groceries. The main problem for her when she is not able to leave her house is that she then is isolated and feeling alone: She misses the chats with people she talks regularly to, as the shop assistants at the shops and at the post office. She also loves to join the weekly bridge afternoon which is organized by the local church. She then has the chance to see other elder ladies from the quarter she otherwise could not meet as all are not so mobile anymore, due to the same or other health-related reasons, and do not live in walking distance. As the bridge meeting for all is a traditional event they join since long time, their children try to bring them to the church center by car, but it is not always possible for all to participate, dependent on the availability of the children.

Rosa is a widow since three years, and she has also lost her siblings who all her life had been her close social network. Her family relations today are reduced to her daughter and son-in-law with their two 8 and 10-year old daughters who are living quite far away in another city. They come to visit the grand-mother regularly once a month on a Sunday. As she is more and more bounded to her house, Rosa is very happy that her son-in-law bought her a special TV which can more than only watching TV:

- I. **[General Connectedness]** She likes to watch a daily TV show – as much as some of her bridge ladies, too. In the past, when all were more mobile, she and three of the ladies met often to watch the show together. The special TV allows now a watching situation as sitting all together in front of the TV: when she activates a “buddy-list” overlay, pictures of the ladies from her network who are also watching the show are shown. She can also see if some of the ladies are watching another program, and she can invite them to watch the program she is watching. If they accept, the TV automatically switches to the right program. They can then also chat by text input or even talk to each other and comment the show. If one of her friend does not appear on the “buddy-list” she can contact her to let her know that other friends are watching the TV show.

Other shows she likes to watch “together” with her grand-daughters, they either arrange dates for commonly watching TV or sometimes they just show that they are watching a program and then Rosa knows “ah, they are there”. The children and grand-children also like the feeling that granny is also “there” when she has activated the “I am also on the sofa” - button. For these situations of “just being there” as sitting beside each other on the sofa without talking rather just watching, Rosa likes her “caress-y”. It is a little ball which vibrates and gets warm when the remote grand-daughters have it in their hands and stroke it. Also Rosa can transport her emotional feelings via stroking the ball to her grand-children.

- II. **[Video chat]** It often happens that after the show they start a video chat. Rosa likes this new way of talking to each other very much and the new TV has enriched the basis for a chat with her grand-daughters. In former times they only talked on the phone, but it was hard to find interesting topics for a longer chat with the children who often were too impatient for a longer telephone chat. Now the commonly watched TV program is a nice hanger to start a conversation on topics both are interested in.
- III. **[Gaming]** As Rosa has reported to her bridge ladies on the advantages of her son-in-laws' special TV some other also have bought and installed one. As many of them are no more able to join the meeting regularly, they have started to play bridge via the TV. There are different ways of starting a game. Via the menu Rosa can invite the ladies and propose a date for the next game. Or they decide to start a game spontaneously after haven commonly watched their TV show. The game is displayed like that: they all see a 3D bridge table, and figures representing the players. Each player sees her cards and can easily select a card and put it on the table. Further the level of distribution can be different. On some days Rosa plays with two of her friends physically together on the table against two other friends which are physically together too over the internet. The System can flexible integrate single player or groups of player which are physically together or distributed. She also likes to "meet" her grand-daughters for common games. With them she plays gym games. She opens then the virtual "gym" and can see her and the children as figures on the screen. By means of a controller and stripes which she puts around her arms and legs she can play different immersive games with the children. She likes the games very much as she can adapt movements on the screen to her daily conditions, e.g. when she cannot lift her arm very high she can accomplish small movements and the special TV adapts them to the game.
- IV. **[Being connected by sensors in the house]** As Rosa is often doing homework in the kitchen and then cannot notice if an invitation for a "couch game" or "couch experience" is entering on the TV, she likes her notify device "Noty". "Noty" is a smart-phone/picture-frame-like device which displays photos of the persons of her inner network – as her ladies and her family members – when these are on the TV and have sent an invitation to a common activity. "Noty" also displays notes of the people. "Noty" also contains some symbols which represent the grand-children. When the color of the symbols change, Rosa gets a sense of the activities of the children, e.g. green shows that they are playing outside in the garden. She likes this very much as she – despite the distance – has the feeling that she is connected closely to her children and grandchildren and can take a bit part at their lives. Noty also can do something else: it gives a sense of activities which have happened in Rosa's virtual community. Then Rosa knows who of her peers in the forum are online and she can decide to go her special TV and join the activities in the forum she likes.
- V. **[Virtual groups]** "The internet" always has been something to Rosa which is only useful for younger people. But since her special TV also provides access to the internet she developed an interest to use it, too. As she had heard that you can find everything in the internet, she has asked her daughter to search together with her for information on coping with arthritis. Through the TV

she can also access community forums, where she can help her peers or ask for advice. They detected a forum where affected persons exchange their experiences. Rosa now likes to take part in discussions on that forum. She has found some very nice other people with similar problems. She has even invited some of them, after she knew them for a while, to connect with her on her special TV device to be able to voice chat or video chat.

- VI. **[Media exchange platform]** Another experience the special TV provides is her “modern photo album”. Here, her family can send photos. As taking a picture and uploading it is very easily done via smart phones, children and grand-children send photos very often and of every-day activities. Rosa can also see the arrivals of new pictures on “Noty”. The same can be done with videos. But Rosa can also produce content and send it to others. She herself can take pictures and videos with “Noty” and send them to peers and family. She is especially thankful for being able to write down a shopping list using “Noty”, which is then transported to her neighbor. She prefers to send the list on this way as she is afraid to disturbing her neighbors when she calls them on the phone. The neighbors are free to choose the way they wish to receive the list, either via email or sms. Rosa’s grand-daughters or she herself can also record a program which is broadcasted too late in the evening, when Rosa and the grand-daughter are already asleep. This program will then be available on the TV and they will be able to decide when they want to watch the program together.
- VII. **[Sharing common activities]** Besides watching TV together, Rosa can also share other activities with her peers or family. She likes to cook and she would like to share this experience with others. “Noty” knows when she is cooking (through sensors in her kitchen appliances) and notifies others as soon as she starts. When someone wants to join her, they can set up a voice or video chat while cooking. Noty also allows transmitting the recipe to others so they can cook the same food.
- VIII. **[Window to the quarter]** As so many elder people who are living in the quarter are not so mobile anymore, the church has started a project to bring events to the peoples’ living rooms. They have installed cameras on different public places in the quarter. Rosa likes to open the “quarter window”, especially the park where the children play in the afternoons. Due to privacy protection, only the silhouettes of the people are being transmitted.
- IX. **[Training together]** As Rosa is suffering from arthritis, regular exercising is very important for her. Using her TV she can join specific exercise courses which help her to improve her coordination abilities. Rosa’s friends, who suffer similar pain from now and then, are also interested in doing exercises. In cooperation with a physiotherapist, a group-gym lesson is organized and transmitted via the TV on a regular basis. Thus, Rosa can stay in contact with her friends and practice her exercises. To ensure that Rosa does not overextend herself and fulfills the exercises in a correct way, the camera, which is usually used to communicate with her relatives and friends, is used to transfer her picture to the screen of the physiotherapist. In addition to the visual monitoring of the movements, Rosa is wearing a pulse meter, recording the course of her heart rate during the exercise lesson, which can be used as feedback of the intensity for the physiotherapist. After the

training, Rosa receives automatic feedback on her training progress and is reminded to drink something afterwards.

- X. [Organizing and support]** Rosa has not only bad days. On some days her only problem is that she lives too far away from her friends. Her family has not always the time to drive her around so that she can anticipate on her favorite events. As a work around Rosa sometimes uses the taxi or the public service system (bus, train and so on). But the taxi is very expensive and if she takes the bus it's often very complicated and exhausting because Rosa has to change the bus very often. The System can help Rosa and her friends to stay connected and help to organize the meetings. Therefore the system connects the meetings of all of Rosa's friends and searches for similarities. If the system recognizes that Rosa and some friends want to go to the same event, the system plans the way for all participants. The system may recommend driving with the taxi because all friends live near the route to the event. So the costs for the taxi could be shared. Further, the system can help finding new Events for a group of people. If Rosa and some friends want to do something new they can ask the system for support. Based on the interests and the situation of Rosa and her friends the System can provide suggestions for new activities. The activities could be evaluated by distance, by disabilities (maybe someone couldn't walk for long distances...) or by chances and abilities (maybe someone of the group has a car or will be driven by family) of the participants.
- XI. [Smart Furniture/Smart Lamp]** Rosa likes to sit in front of her working desk, reading newspaper, doing some daily tasks.
- a. The "SmartLamp" looks like a desk lamp (that can be also used as a classical lamp). It can project pictures, video, browser, news and custom interface for interaction on top of the desk. Rosa interacts and manages information on the desk by finger touch or touch-and-drag. She can also use digital pen to enter text or push the content. The lamp has a camera that tracks Rosa's finger movement. Small projectors project multiple screens of information on different places which can Rosa re-arrange as she wants by finger drag. The projector can also project on wall if lamp is close to the wall.
 - b. Smart-Lamp projected info can be easily managed by finger touch or digital pen. The size of text, size of content can be increased to a level of size of the desk which can be much bigger than typical home LCD/Plasma TVs. Due to decreased dexterity in fingers, Rosa likes simple navigation by hand and digital pen.
 - c. Rosa can find every day news on the table to read, it will automatically project as she approaches the lamp
 - d. Rosa can get pictures or videos sent by her family to the lamp when she approaches the lamp or access specific application for watching (as Media Exchange Platform)
 - e. When family member or friend calls Rosa, the picture/video of member/friend is projected on wall or desk, and/or sound/music is generated. The link can be established when Rosa approaches desk and accepts the call.
- XII. [Gesture recognition user interface]** As Rosa is suffering from arthritis, using a standard keyboard or a mouse is problematic for her. She rather likes

to control her media- and gaming platform by simple hand and arm gestures. When she sits in front of her media center or TV furniture she is recognized and welcomed by the system. A number of options to use the system are displayed. She is able to control the system, navigate through menus and select the option she likes by about 10 basic hand and arm gestures. The same gesture recognition supports her in doing her exercises in a correct way. Differently than with many other systems Rosa does not need to use an electronic pen or hold a reflective device ('marker') which easily get lost in Rosas apartment as she often forgets where she puts things.