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Förderung sozialer Interaktion im Themenfeld AAL – Erfahrungen aus der Verbindung von SmartHome und Living Lab Methoden

Fostering Social Interaction in AAL: Methodological reflections on the coupling of real household Living Lab and SmartHome approaches

AAL_Ambient Assisted Living_Social Interaction_CSCW_Living Lab_SmartHome

Zusammenfassung. Um neue IKT-Lösungen innerhalb von AAL-Projekten nutzerorientiert zu entwickeln und zu evaluieren, erscheint die Verbindung des Living Lab Konzeptes in realen Haushalten mit der Verwendung eines SmartHomes als Testumgebung vielversprechend. Basierend auf unseren Erfahrungen innerhalb des AAL-Projekts FoSIBLE stellen wir eine Verknüpfung beider Ansätze vor, um Social TV Systeme hinsichtlich der Nutzer-Akzeptanz bzw. Ablehnung sowohl aus einer Vogel- als auch Froschperspektive untersuchen zu können. Hierfür beschreiben wir die methodischen Strategien beider Ansätze und analysieren die jeweiligen Vor- und Nachteile, um aufzuzeigen wie sich die Ansätze in unterschiedlichen Projektphasen ergänzen können.

Summary. For user-centred design of ICT solutions in the AAL field, an approach combining real household living lab and SmartHome lab seems promising. Based on our experiences within the AAL project FoSIBLE, we propose a mixed-method approach to develop and evaluate a Social TV system from both a bird's eye and worm's-eye perspective in regards to user acceptance and rejection. We provide insights into the methodological strategies and analyse the strengths and weaknesses of our proposition to demonstrate how the different methodological approaches can augment each other in the different phases of AAL projects.

1. Introduction

ICT design for and with elderly people poses specific challenges and barriers due to their often low affinity and familiarity with new media. A central problem is how to communicate with prospective elderly end-users about product ideas which, from their point of view, often are very abstract and do not fit to their accomplishment of their every-day life at all. Furthermore, researchers are lacking knowledge of the elderlies' every-day life and respective 'anchor points' in individual every-day contexts to which they could link their technological ideas and set up a common frame of reference for further discussions with end-user groups.

User participation and communication between users and developers are necessary for the potential of the system to be tapped fully (Niitamo et al. 2006). This is even more important when designing for the mundane area of domestic life, as the design of artifacts impacts the social systems of the users who appropriate them. This is why technology cannot be separated from its interaction within the socio-cultural context of (prospective) use (Niitamo et al. 2006).

This is why established methods for requirements elicitation and prototype evaluation, such as empirical user studies and participatory approaches (e.g. design workshops), recently are being complemented by Living Lab methods, which are seen as an option to bring the worlds of end-users and technological prototypes together so that representatives of the target group are able to reflect on prototypes against the background of their individual every-day lives and practices.

The Living Lab concept was introduced by Mitchell (Erikson, Niitamo & Kulkii 2005) and is more and more becoming a popular approach to investigate user experiences and to gather valuable information from the practice of users. The first Living Labs were designed for the evaluation of technology of smart or future homes. For this, participants lived in these houses for some days and were observed in a real life context (Erikson, Niitamo & Kulkii 2005). Today, researchers are aware of the high potential of the Living Lab approach wherefore various Living Labs have been built all over the world (Budweg et al. 2011).

Living Labs as new paradigm are operating as a User Centred Open Innovation Ecosystem (Pallot 2009), to promote a more proactive role of users from user-centred design and user experience towards user co-creation.

The Living Lab concept as a research method in user-centered design is utilized heterogeneously, from simulated

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homes (SmartHomes) where technology or a product is available and where users come to stay for a period of time (Intille et al. 2005), to environments of real user households with use and appropriation of technology over a longer period of time (e.g. Obrist, Bernhaupt & Tscheligi 2008). Each 'application' of the Living Lab concept has its advantages and drawbacks: In controlled labs, researchers have the possibility to test products with a large number of participants, but these tests are normally limited to short time duration and artificial settings. On the other hand, long-term evaluations with users overcome this limitation, but the test scale is normally limited to a smaller number of participants, due to the higher effort to work in the field. In addition, it takes specific effort to attract elderly people and their private households as partners for a long-standing research activity over several months or even years. Acknowledging these differences, we took the opportunity to explore and analyze a mixed methodological approach during a jointly conducted multi-year AAL project, combining: (1) the build-up of a network of end-users and their households as real test beds over the full course of the three years project and (2) the usage of a SmartHome Living Room environment as a semi-realistic lab environment.

Within the project, a Social TV community platform aiming at providing social support among peers, friends and family has been developed. The central technical platform of the FoSIBLE system is a Smart TV system based on Hybrid Broadcast Broadband Television (HBBTV) that provides discussion functionalities, games and awareness support. Furthermore, the Social TV platform supports a visualization of others in form of a Buddy List that shows who is currently watching which TV channels, as well as functions like the recommendation of currently running TV broadcasts.

In coupling SmartHome and long-term home environment living lab processes, we aim at better solving the tension between abstraction and concreteness as a specific challenge when designing ICT for and with elderly people who are not familiar with current media devices. Our methodological approach provides specific benefits for both, by (1) opening up a common frame of reference between project researchers and elderly participants and by allowing for continuous settlement of design ideas in the elderly peoples' life worlds, and (2) on the other hand to be able to explore and validate concrete ideas as well as more abstract basic research issues also in earlier project stadiums.

In the following, we will first demonstrate that it is relevant to build long-term relationships with elderly end-users in their homes to understand how new technologies like SmartTV can be embedded in their every-day life circumstances, how these technologies fit to their needs and wishes and what functionalities should be available in a final system. We will then provide closer insights into one of our SmartHome Lab studies analyzing concrete instances of awareness and social presence support dependent on genre in SmartTV environments, allowing us to analyze how specific functionalities should be built and when they should be offered. We finally reflect on the coupling of our approaches and compare the different benefits and challenges to inform the design and methodological approach of future AAL projects.

2. Our real household Living Lab approach

A central objective of building up a real household living lab is to involve the future users in the design and evaluation of the system. This proactive role which consists in bringing ideas from future and real end-users' experiences, desires and frustrations ensures that a broad range of interests, needs and values are addressed in the design work. To attain this goal, a real household living lab approach should be based on two major strands:

1. User participation is set up at project start, and is continuously maintained throughout the project including pre-studies and requirements analysis, prototype development, and evaluation over a long-term period.
2. Findings from the Living Lab activities are continuously transferred to the project members to support negotiation and design idea generation in the consortium and in end-user relationship.

In the following, we aim at shedding light on the considerations and challenges we have been going through with regard to the involvement of elderly people who are not familiar with new domestic ICT yet. Our experiences show that significant work has to be invested in advance before a (final) prototype evaluation can be conducted but that this effort is justified and useful.

Living Lab Measures

Recruiting volunteers

A major issue for AAL projects is the challenge of getting access to elderly people interested in joining a research and development project. This is different to other Living Lab projects in the domestic field which target younger people or young families as participants. The option to test new interactive TV solutions or mobile media such as smartphones or tablets 'for free', or to enrich their technical competences are often a motivation for younger people to participate in research projects (e.g. Hess & Ogonowski 2010). In contrast, we learnt that the reluctance of elderlies towards new ICT is high and that there is rather no motivation related to the technology itself. To lower the hurdle of access to prospective elderly participants, we set-out by contacting French and German local associations where seniors meet in different activity groups. In Germany, we focused on a community interested in learning general computer and internet skills, led by some volunteer seniors who are advanced PC users. We originally thought that getting access to this group would be rather easy, as a general interest for new ICT could be expected among this group. In France, we relied on the geriatric prevention centre "Les Arcades" in Troyes that aims to promote the transition from working life to retirement, to fight against the isolation of the elderly and to anticipate certain effects of ageing via a personal evaluation offering non-compulsory advice.

In both countries, we started by arranging initial meetings where we presented the project objectives and the expected role of the members in the project and asked for volunteer participants to join both a pre-study (mainly in form of semi-structured interviews) and in a later stage the prototype evaluation in their private homes.

To our surprise, although the large majority of the audience was sympathetic to our project, only a few of them wanted to participate - even for the people interested in new media in general. We quickly found out that the major point was that our project ideas were far away from their thinking space, i.e. the abstractness of ideas was often too overwhelming. We learnt that we must provide options for discussion and exchange on a regular basis. We then used two kinds of measures:

1. Give concrete ideas on opportunities for using the system we intend to design through a set of concrete usage scenarios of social television (ideas) and by setting up an initial set of the hardware equipment (exploration) which was later to be deployed in the households.
2. Give the participants the feeling that they are part of the definition of the technology "of the future" in general and not especially for them at that moment.

Interacting with participants

What became obvious in the sessions was that the elderly club members were much less interested in new technologies like Smart TV in general, but rather looked for their benefit in terms of possible new action spaces created by participation in the project and using new technology. After some months of contact and interaction, the group developed a growing interest on us as researchers and asked whether it was possible for them to visit our research institution. We then invited them for a tour through our workplaces/labs.. After that, they stayed for another long discussion. Interestingly, some people who first did not show interest were keen to take some of the devices offered by us at home.

In France, to overcome many of the problems with ''traditional'' requirements gathering with older people, we conducted in-home observations and interviews (Dickinson et al. 2003). This allowed us to see the participants in context, to observe them using their current technology, and to note unexpected points. In fact, older people are commonly unaware of the possibilities of new technologies, and this can severely limit their ability to contribute actively to a discussion about their requirements. Before the roll-out period, the participants were curious about the functions we could "invent" on the TV. They were happy to describe their daily life and habits with communication devices but it was difficult for them to imagine what could be useful for them in the future. This is associated with our experience that the imagination of abstract functionalities is difficult. When we started the installation of the Smart TV in their home, they started to behave in a quite different way, as if every technical question could be taken care of by us. For instance, as soon as the TV was installed in the home of an old lady, she phoned first because her answering machine was not working, then because she got some troubles with her internet connection. It was the same with several participants. We spent a lot of time with them to solve their problems even if they were not related at all with our project.

We would like to point out that we did value the peripheral information collected when answering questions which were not directly related to the project's objectives since it would help us better explore and understand the (prospective) usage context. The only downside was that we could hardly do focused research. During our visits we spent most of time answering their questions before we were able to ask them any questions. Nevertheless, we made the experience that this is really necessary to build-up a common space of understanding in the following evaluation phase.

Lessons Learnt

In retrospective, we have spent much time and effort to get access to our Living Lab participants. In comparison to our experience with a Living Lab approach with younger families, it leads to a different understanding of early stage empirical research in the field of elderly. It does not serve the purpose of data collecting to inform design only, but it is a crucial measure to gain trust for long term user-researcher relation and in this way openness. Based on our long-term experiences over several months so far, we identified several aspects that were of major importance. These aspects around motivation and trust-building are strongly interlinked in real life, but for heuristic reasons are differentiated:

Co-construction of a common notional space of possibility: Finding elderly participants for a long-term R&D project is a challenge and requires being flexible and careful in constructing a common notional space of possibilities. Bridging abstract project ideas (as they commonly exist as more abstract representations in the starting stage of projects) and concrete topics of conversation (which are needed for elderly people to be able to think about what would be meaningful for them) is an ongoing process.

Getting access: Finding elderly persons for only one interview is not a big problem. However, it is different when not only an involvement of some hours, but rather a long-standing involvement is asked. Then people are careful and reluctant at first, and the missing common thinking space contributes negatively to the access problem. The head tutor of the computer club in Germany and the director of the prevention center in France contributed here a lot in their function as a "door-opener".

Motivation: At the beginning of our project we were lacking 'anchor points', i.e. topics of interest of the people to which we could link our view and imaginations of possible ICT usages. In other words, we did not know how to best motivate them. The media as such did not serve as a sufficient motivation. However, the interviews and even more the regular meetings and chats with the participants helped us in identifying common topics.

Trust building: The build-up of a trustful relationship to tutors and members turned out to be the most important basis for a successful living lab set-up and helped us to gain our targets. However, as outlined this requires sincere and continuous personal commitment and effort.

Reciprocity: A mutual relationship at eye level is a crucial milestone for trust building. That means that our research is 'giving and receiving', maybe much stronger than it would be when accomplishing other methods. We not only act as researchers, but also as advisers or technology supporters, and not only during face-to-face meetings, but also when we are reachable by mail and phone. To invite the elderly end-users to our "spaces" in Germany and France was another important activity for an ongoing installa-

tion of eye level. For the elderly club members this was of high importance to get a clearer picture about us.

During meetings with the participants in the computer club environment in Germany as well as in the homes in France, trust building measures contributed to the ongoing construction of a common space of thinking which helped the elderly people in standing the abstractness of a beginning research project and successively back-up ideas against the background of their every-day life. Some even got more courage to dig deeper into the topic, e.g. when taking smartphones at their homes and testing them despite their first reluctance and from that point on, developing their own ideas of use options. Insofar, our long-term Living Lab approach served as a double function: as a door-opener to the space of thinking of non-ICT familiar elderly people and as an ongoing research instrument in the research project. While the real household LL approach has advantages for the evaluation in everyday life, there are challenges to testing specific research questions in a more controlled environment. To address these challenges, we have used additional lab studies in the SmartHome environment our proiect and present our methodological approach, measures and results in the following sections.

3. Our SmartHome approach

To test the developed prototypes in a controlled use situation and to involve additional test users into the development process, we conducted several studies in a SmartHome Living Room environment in Germany.

In contrast to real household living labs which often require prototypes of a more matured stage for evaluation, lab studies can be conducted at an early stage and early results can be included in the development cycle to adapt the system. The controlled and focused lab situation supports that also only specific parts or concepts of the prototypes can be evaluated. So to speak, the tested technological application is considered from a worm's-eye view. Nevertheless, as it is difficult for elderly people to imagine ICT ideas or solutions that are currently not available, it is helpful to offer concrete functionalities of the technical system to the test users.

Although our evaluation included the described characteristics of a classical lab study, it also contains aspects that go beyond that. One aspect is the implementation of our studies within the Fraunhofer InHaus 2 Center in Duisburg, making use of a SmartHome environment with two semi-realistic living rooms in which a real TV situation scenario can be simulated. In order to reinforce the living room atmosphere, we placed common furniture items as well as decoration in the two rooms. In this way the artificial context of normal laboratory studies was substituted by a more natural context. Based on the participant's responses, the provided environment in the SmartHome living rooms made it possible for participants to 'feel at home' and behave similar to as in real life, in contrast to traditional laboratory studies that are often conducted in more abstract lab environments.

In the following chapter, we provide closer insights into one of our SmartHome Lab studies analyzing concrete instances of awareness and social presence support depending on the TV genre in SmartTV contexts. This allows us to analyze *how* specific functionalities should be built and *when* they should be offered.

SmartHome measures

The main focus of our study was the measurement of social presence and awareness evoked through different visualizations (buddy list, photos and video) of recipients while using Social TV applications at remote locations, as well as the genre-related use (Schering & Budweg 2012). Our starting point was the notion that "presence and awareness are two closely related factors in a Social TV context" (Zwaaneveld 2009) and need to be taken into account when designing new ICT. This requires to be 'aware' of others and e.g. to be able to take notice and react to someone else watching TV at the same time together with you. Although a number of relevant definitions of awareness exist, the concept of affective awareness defined as "a general sense of being close to one's family and friends" (Liechti & Ichikawa 1999), plays an important role for our approach. Social presence is – besides other definitions – described as "the sensation of 'being together' in a mediated environment" (IJsselsteijn et al. 2000).

Our second research focus, the evaluation of genre-related Social TV use, is based on the finding that 'watching TV' is often treated as a generic situation. This can be problematic because people show different (communication) behaviour depending on the TV genre that is currently shown, as well as having the wish to watch some genres alone and others with different person groups (Geerts et al. 2008).

Study implementation

In each test run of our study in the SmartHome Living Room environment two participants took part in pairs and first had to watch a recorded TV program in the two separated rooms. Based on the results of a pre-study (Schering & Budweg 2012), the three genres chosen for the program were film, soap and sports. Depending on the experimental condition, the recipients were represented either through a buddy list, a video or photos that were taken in specific intervals on the TV. After experiencing the remote TV situation, the participants were asked to answer parts of the "ABC-Questionnaire" (IJsselsteijn et al. 2009) and the "Networked Minds Questionnaire" (Biocca et al. 2001) in order to explore their sense of social presence and awareness. A following semi-structured interview explored how they experienced the Social TV application during the particular genres.

SmartHome Results

The analysis of both the feelings of social presence and awareness as well as the genre related use of visualizations provided interesting results. The buddy list in combination with a video transmission was considered the best solution to feel 'aware' of others while watching TV at remote locations. Nevertheless, also the lone, 'un-social' TV situation must still be possible, therefore different combinations and even complete fading out of the visualizations should be offered. This goes along with our participants' rating of the representations depending on the genre: they wanted to consume films on their own without communication, while sports and soaps were favored for

a jointed TV experience (Schering & Budweg 2012).

Lessons learnt

Through the realization of our SmartHome Lab study, we could achieve some deeper insights into the understanding of user requirements and needs for the Social TV context. The study revealed relevant results although the evaluation did not take place in a longitudinal field test as in the real household Living Labs. On the contrary, it would have been difficult to analyse these special questions in the real household living lab, because of the possible influence of extraneous factors. A common challenge when exploring the influence of visualizations on social presence and awareness is e.g. that the experiences can be influenced by the perception of environmental factors. Through our SmartHome Lab analysis we could strengthen that peripheral awareness information plays an important role for Social TVs, and that 'watching television' should not be treated as a generic situation.

When preparing our study, we realized that many lab studies in the past often dealt with (for end-users) rather abstract research questions. When investigating social presence and awareness, it is based on our experiences recommended to focus on concrete prospective functionalities addressing these issues instead of waiting for the possibility to evaluate the whole system. Nevertheless, this requires building early concrete prototypes and environments that allow for a realistic user experience. For instance, in our study the designed buddy list, the photo and the video transmission allowed participants to make their own real experiences. Only in this way participants were able to provide concrete user feedback which can be further used in the development process. This illustrates that concreteness is very important – in the SmartHome Lab study as well as in the real household Living Lab approach as we have noted in the previous chapter.

To summarize, we can conclude that SmartHome Lab studies are a suitable approach for focusing on specific questions together with the avoidance of external influences. They provide the necessary opportunities to test specific functionalities of the prototypes and concepts already at an early stage of a project. However, also in SmartHome lab approaches it is important to test concrete prototypes in realistic environments, allowing users to make experiences that are as close to their real environments as possible by using a realistic living room environment equipped with plants, sofas, and common artefacts of daily life. Our SmartHome Lab approach can therefore be seen as both a preparation and an opportunity to contrast and reflect on the on-going field tests our real household environments.

4. Discussion

In the chapters before we presented the results of two different methodological approaches: the real household living lab and the SmartHome Lab approach. In the following, we will compare them with regards to the challenges and benefits of AAL project work.

Advantages of each approach

The real household living lab approach showed to be important to understand mundane every-day practices that are linked to technology attitudes and acceptance. Furthermore, it enables the processes of co-development. This perspective of co-development must be adopted, as practices will change with new technologies. The living lab real household approach demonstrated to be an important measure to evaluate new technologies for mundane and every-day life circumstances of elderly users.

On the other hand, the SmartHome Lab environment enabled the focus on specific research questions and provided fast results. When focusing on genre-related questions, it was important to get user feedback directly in the context of the relevant genre and in an environment with limited external influences to avoid distorted results.

Benefits of coupled approach

As we have seen before, there is a dilemma with the real household living lab approach: it is important that the product ideas, concepts and functionalities to be discussed are not too abstract. Therefore, participants have to find concrete functionalities, which might even be abandoned in the later project evolution. However, non-stable prototypes and concepts especially in earlier phases cannot be tested in real household living labs as this might damage long term trust-building. Conducting test sessions in SmartHome Lab environments can therefore be accomplished with less risk, as participants are not challenged in their home environment and have constant help available. Furthermore, results from SmartHome Lab environments can be used as preparation for real household field tests. In addition, for the decision to integrate special functions in the system, it is important to analyze the general needs of the users beforehand. This means that different functionalities can be considered out of a worm's-eye view. In this way, redundant developing effort can be avoided. To sum up, the coupling of the SmartHome Lab evaluation and the real household Living Lab has demonstrated multiple benefits because it led to iterative results complementing each other. Furthermore, the different methodologies are well suited for different project phases and address the presented dilemma of abstractness and concreteness. While SmartHome Lab environments seem especially suitable for early stages and for testing specific functionalities, the real household Living Labs permit to evaluate a more mature system in the daily life of end users. Providing concrete functionalities proved to be important in both approaches and contributes to the bridging of abstract project ideas to concrete, mundane practices surrounding the newly developed technologies.

5. Conclusion

In this paper, we described our results and experiences with the two methodological approaches real household Living Labs and SmartHome Lab studies in the AAL-JP project FoSIBLE. In this context, we illustrated the existing dilemma of concreteness and abstractness. Furthermore, we identified the individual advantages and challenges of both approaches. We have learned that the coupling of both SmartHome and real household Living Lab approaches proved to be helpful to identify both what should be integrated into a Social TV system as well as how it should

be designed over the different phases and development stages of an user-centered AAL project.

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