HOW MUCH DESIGN DOES RESEARCH NEED: AN INQUIRY OF THE SYNERGETIC POTENTIAL OF METHODS OF SOCIAL AND DESIGN RESEARCH.

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Abstract

This paper presents the findings of a study with end-user involvement with the ultimate goal to test the synergetic potential of methods of two different research realms: on the one hand methods of qualitative social research and on the other hand methods of design research. The case for the appliance of this new mixed methods approach is the end-user requirements engineering phase 1 for the research project RelaxedCare, organized and co-funded within the Ambient Assisted Living (AAL) Joint Programme of the European Commission. The purpose of the project is to develop solutions and products to connect elderly persons (assisted persons) and their relatives/friends (informal caregivers) in order to create a more relaxed care situation. AAL projects use in general quantitative and qualitative methods of social research for accessing user requirements. For the phase 1 of the end-user requirements engineering methods of both areas are chosen to find out if a trans-disciplinary research approach would reveal more significant findings concerning their translation in a holistic product development process and aim at creating a "best of both" research methodology.

Keywords: Early design phases, Requirements, Research methodologies and methods, User centred design, Visualisation

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1 INTRODUCTION

This paper presents the findings of a study with end-user involvement with the ultimate goal to test the synergetic potential of methods of two different research realms: on the one hand methods of qualitative social research and on the other hand methods of design research. The case for the appliance of this new mixed methods approach is the end-user requirements engineering phase 1 for the research project RelaxedCare, organized and co-funded within the Ambient Assisted Living (AAL) Joint Programme of the European Commission. The purpose of the project is to develop solutions and products to connect elderly persons (assisted persons) and their relatives/friends (informal caregivers) in order to create a more relaxed care situation. Through the detection of the actual state of the assisted person and the transmission of the collected information pervasive and unobtrusively to the caregiver, the project also encourages an interaction between the two target groups using the developed system and its products in a fruitful, easy and fun manner. AAL projects use in general quantitative and qualitative methods of social research for accessing user requirements. For the phase 1 of the end-user requirements engineering a trans-disciplinary research methodology was chosen. The methods of both areas are not chosen in order to be subject of examination but to find out if a trans-disciplinary research approach would reveal more significant findings concerning their translation in a holistic product development process and aim at creating a "best of both" research methodology.

As Sandner (2014) points out the majority of existing AAL solutions focus on supporting persons in need of care. A representative study (Pochobradsky et al., 2005) conducted in Austria in 2005 showed that 80% of the people in need of care receive their care by informal caregivers (ICs) at home. Moreover, more than 66% of these caregivers feel overburdened by that task sooner or later, which results in a loss of quality of the interaction between the two parties. To reduce the necessity of regularly checking the current status of a person at home by driving by or calling, RelaxedCare aims to provide a system to keep informal caregivers updated on the overall wellbeing of their older relatives (assisted persons) in a passive and pervasive way. This information is delivered to the informal caregiver via everyday objects like, for example, a colour changing lamp, a picture frame or a smartphone. Additionally, the RelaxedCare system can provide more detailed information for the caregiver if this is desired, keeping in mind the security and privacy aspects of the assisted person's (AP) data. Furthermore, the RelaxedCare system may help to increase emotional bonding of the involved parties by offering the possibility to actively interact with the other partner.

The end-users – informal caregivers and their corresponding assisted persons – have been involved in the RelaxedCare project right from the beginning. This approach was chosen in order to keep the focus, development process and the overall goal of the project as closely related to end-users' desires as possible. Additionally, such an approach assures a higher acceptance rate of the resulting system as well as higher benefits for the stakeholders since they are invited to actively contribute to the design and functional aspects of RelaxedCare. Therefore, the RelaxedCare project is committed to the user-centred design/development (UCD) and applies the ISO 9241-210 (Ergonomics of human-system interaction) (International Organisation for Standardisation, 2012) during the user requirements engineering phase. The international standard provides requirements and recommendations for human-centred design principles and activities throughout the life cycle of computer-based interactive systems. Furthermore the "user inspired innovation process" (Dittenberger, 2012; Morandell et al., 2014) is applied consisting of the steps: ignite, perceive, collect, decode, assemble, experiment and merge, as this process enables the active involvement of knowledge and methods from different areas of academic research, design and industrial practice.

2 RESEARCH APPROACH

The research process for the first end-user requirements engineering phase was designed as an unstandardized qualitative research study (Flick, 2009). This was a comparative study broken down into five phases, employing eight methods in total deriving a) from the field of design research (Assumption Personas and Personas, Show and Tell Method, Cultural Probes and Design Workshop) and b) from the field of qualitative social research (Questionnaire, Focus Group Discussion and Contextual Inquiry Interview). The applied research methods aim at uncovering relevant factors for

assessing user needs at an early stage of the project. The study design with the mix of methods deriving from the field of the mentioned research areas was chosen to ensure a profound output as a basis for the subsequent project development process. Key questions behind the selection of the methods were: Which methods offer the most useful information for a user-centred design project like this? Does the output deriving directly from the design research methods generate any additional value, which classical methods are not able to create? The study was conducted with participants from Switzerland and Austria in the period between June and September 2013 and involved a total of 207 test persons, composed of 155 females and 52 males with an average age for assisted persons of 77 years and for informal caregivers of 66 years. The methods Assumption Personas and Personas were conducted among the project team members only.

2.1 Study Design

During the first research period in the very beginning of the project, the following set of methods deriving from the fields of social research and design research have been chosen for addressing different purposes. In order to arrange the chosen methods in a consequential process the methods of the study design have been split up into five phases:
Phase 1: Assumption Personas - Personas (design research - design research),
Phase 2: Questionnaire and Show and Tell Method (social research - design research),
Phase 3: Focus Group Discussion and Cultural Probes (social research - design research),
Phase 4: Design Workshop (design research),
Phase 5: Contextual Inquiry Interview (social research).

2.1.1 Research Methods - Description

Phase 1: Assumption Personas (design research) - Personas (design research)
Due to the fact that the Personas method may last for several years to be completed (Pruitt & Adlin, 2006) the approaches of Assumption Personas (Adlin, 2011) and Ad-Hoc Personas (Norman, 2011) which lead to faster results, has been chosen to get a common understanding of both target groups (informal caregiver and assisted persons) among the project team members. The goal to apply the Assumption Personas at the beginning of the study was to initiate an intensive discussion and to create material for reflection and guidance during the entire development process. This process - first capturing individual team members' assumptions about our target groups, and then learning from the users about where and how these assumptions were right or wrong - aim at supporting the goal of questioning and revising the teams mental models, and to enable fruitful discussions focused squarely on the real end users of the project. After the conduction of all methods during the research study the Assumption Personas get compared with the findings of the study to enable the researchers to create fact based Personas (Martin & Hannington, 2012). Phase 1 with its methods is designed as a frame for the whole user study using the Assumption Personas method as an initiation for the end-user research and the Personas method for summarizing the findings gathered throughout the whole study.

Phase 2: Questionnaire (social research) and Show and Tell Method (design research)
The Questionnaire (Bortz & Döring, 2006) was created based on the idea to collect information on preferred free time activities, preferred objects and preferred places at the homes of the target group of the elderly. The aim of the survey was to get at an early stage of the research process a first impression and ideas about fun-causing activities, favourite objects and the places at home where the persons of the target group prefer to stay. Based on Curedale (2012), the Show and Tell method is defined as an oral down-to-earth interview technique which can be executed in any location. Persons belonging to the target group are asked to present objects they carry with them in their bags. Only those objects are presented that people like to show voluntarily. Each object which is shown is described and marked by the interviewer. Background-stories and motivation for carrying certain objects are to be discovered by asking more detailed questions. The goal of this research method is to identify objects of everyday life which people carry with them when leaving home and their motivation to do so. The methods of the second phase were chosen to find structured impressions and insights into the everyday lives of people and their preferences in terms of product criteria.

Phase 3: Focus Group Discussion (social research) and Cultural Probes (design research)
The method Focus Group Discussion is a qualitative method to gauge the opinions, feelings and attitudes from a group of carefully recruited participants. Focus Group Discussions can create a group dynamic that provide insight into themes, patterns and trends. In a peer setting participants are more likely to share experiences, stories, memories, perceptions, wants and needs. (Lamnek, 2010) The goal of the Focus Group Discussion is to provide a deeper insight regarding the current state of care situations, needs, desires and emotions, mental models, interaction and communication patterns with family members and friends. The Focus Group method was chosen in order to discuss the findings from phase two directly with the participants of both user groups, while at the same time support the preparation of a Cultural Probes package to gain insights and vital pieces of information relating to the project scope.

Cultural Probes are provocative packages given to participants to get insights in their everyday lives, living environments, thoughts and interactions by putting diverse questions and asking the participants to perform certain tasks within a defined period. Defined as an exploratory research method, cultural probes are intended to serve as an inspiration to identify key patterns and themes that might emerge from the group of participants and may be used as elements to inspire proposals for future product possibilities and design solutions. (Martin & Hannington, 2012) The Cultural Probes package includes a diary and either a disposable camera or a memory card for the use of a digital camera. The participants should keep a diary during a period of seven days, should document their living space, their favourite place and object at home, also a hated object in their home and should note whether they possess a talisman. The final section of the prepared diary includes space for personal notes.

Phase 4: Design Workshop (design research)
The method Design Workshop was chosen in order to be able to extract product design criteria which are not only functional, but reveal information on preferred emotional and haptic aspects. Using the creative potential of the participants, this workshop aims at starting a conversation about possibilities of product criteria. Therefore emotions, feelings, personal bonds and haptic preferences from the target group related to objects had to be revealed. Based on Martin & Hannington (2012), the Design Workshop consists of three sessions addressing: subject – object relationship, picture-word cards and a collage for a beloved and a hated object in their households.
In the first step the participants are invited to think about objects situated in their own home or personal environment and to brainstorm with reference to the following aspects in order to obtain product criteria emerged from individual subject-object relationships: beloved criteria on daily objects, objects telling stories, objects used in a special manner, displayed objects in their flats and hated objects. Secondly the participants receive 20 different words and 20 different pictures concerning the term „joy“, as well as 20 different words and 20 different pictures concerning the term „relax“. For each term (i.g. „joy“ and „relax“) attendees had to choose 5 words and 5 pictures out of the given offer of pictures and words, namely those which fit their personal affinity or idea of „joy“ and „relax“ the most. Finalizing this session, each participant has to create subsequently two collages (one for „joy“ and one for „relax“) with his or her personal choice of pictures and words and gets encouraged to complete the collages with additional written explanations and motives explaining the personal meaning behind the chosen pictures. The third session consists of the presentation of a beloved object and a hated one, which the participants bring along from home.

Phase 5: Contextual Inquiry Interview (social research)
The last phase schedules Contextual Inquiry Interviews which are used to obtain structured and tightly focused information on technological items already in use in everyday life, particularly addressing the technological devices and motivations of their usage in everyday routine among both user groups, as well as to obtain information about possible usage of technological devices for care situations.

For the methods Assumption Personas, Personas, Show and Tell and Design Workshop the data collection procedure qualitative observation and qualitative visual material were chosen. During the conduction of these methods the data recording procedure observational protocol was applied. For the method Cultural Probes the data collection procedure happened through the handing out and later on the collection of the cultural probes packages filled out by the participants of the study. For the

methods Questionnaire, Focus Group Discussion and Contextual Inquiry Interview the data collection procedure qualitative interview and the method interview protocols were applied for the data recording procedure for these methods. (Creswell, 2009, p. 178-183)

3 RESULTS OF APPLIED METHODS

As mentioned in chapter two the methods Assumption Personas and Personas under phase 1 were designed to build a frame for the whole user study and were conducted with team members of the project team only. During a common creation process visual Assumption Personas characterized by specific demographic data, names, defined social interactions, state of health, use of technology and preferred objects were defined.

The vast material collected in phase 2 - 5 during the study was analysed using a phenomenological approach. The procedure started with a coding process of the results for each method described in the previous chapter. For each method the collected material was organized and segmented into sentences and categories which means to analyse the material concerning phenomena and significant statements for each user group in order to create meaning units. (Creswell, 2009, p. 186)
The coding process was conducted using the following questions (Flick, 2009, p. 167-172):

- What? What is it about? Which phenomenon is addressed?
- Who? Which persons or players are involved? In which way do they interact?
- How? Which aspects of the phenomena are addressed or not addressed?
- When? How long? Where? Time, course and location?
- Why? Which reasons are mentioned or are to be opened up?
- What for? For what purpose or intention?
- With what? Means, tactics and strategies to reach the goal.

The successive description presents an overview of the results per method after the conduction of the coding process.

Questionnaire
The participants, assisted persons, report two favourite activities, namely travelling and hiking. Other hobbies or leisure activities are reading, working in the garden, driving by train or activities with the family especially with grandchildren. It is clearly indicated that the majority enjoy outdoor activities. Favourite objects are the kitchen and the garden, the latter is furthermore the place where test persons prefer to linger besides the living room and the kitchen.

Show and Tell
Each and every test person, assisted persons, carried a wallet which is therefore an essential object when leaving home. Other objects as handkerchiefs, keys and mobile phones were each frequently mentioned. Researchers noticed a special emotional bond to certain talisman inside participants' bags, e.g. pictures inside their wallets or on their key pendants.

Focus Group Discussion
Informal caregivers say about assisted persons that they dislike new technology, that they underestimate their health status and often do not want their disease to be made public. They don’t call if something happens. They wish for more time for themselves, for help from professionals, to know that everything is ok, to have networks available as a kind of emotional back up to exchange information and experiences, to be informed immediately about critical health situations, to get a distance from their caring routine, to share the burden of caring with others and they wish for a bit of light-heartedness in their lives. The most important communication tools for informal caregivers are a phone, a mobile phone and personal contact. This group sets great value upon the human factor behind technological devices; they want to be assured that a human being takes the final responsibility.
The assisted persons say on the other side that they don’t want to disturb their informal caregiver. They say that they wouldn’t feel controlled by the use of technology, quite the contrary they see items of technology as potentially helpful to reassure their beloved ones that they are well. This group

enjoys already (time) independence offered by communication tools. The most preferred way of communication is personal contact. The phone is also used regularly. Although using the phone frequently, it is not a suitable tool in case of emergency situations, in which the assisted persons cannot act anymore (e.g. due to a stroke). Having good neighbourhood relationships make them feel more secure.

Cultural Probes
Both user groups like their landline phone, to watch TV, photos, a fire place, the living room, the garden, their home office, a talisman and in general products which generate a positive user experience. There is large agreement among participants about housework, which is noticeably disliked. When leaving home, mobile phones, wallets and keys are mostly taken along by the test persons. Their families are the most important thing in their lives. Favourite items are the radio and books. Social interaction is indicated by visits from family members/neighbours/friends or visiting them in return, as well as telephone calls to family members.

Design workshop
Participants, informal caregiver, love things which are connected to their personal life, having created a strong relationship over a certain period of time. Those things are related to certain periods in their lives, journeys or experiences. Mostly the mentioned things like souvenirs, talisman or heirlooms accompany the participants during a lifetime, telling personal stories and serving as a memory anchor. Often things are intentionally staged for either historical motives or for their aesthetical appearance. Participants cannot bear things which do not function well and things that smell awful. Products are remarked positively if they are easy to use and their usage does not request any fastidious cognitive performance. Joy and relaxation are strengthened by nature, music, children, enjoying food and wine, having time, performing hobbies, creativity and being together with other people.

Contextual inquiry interviews
Informal caregiver use communication media like e-mail, Facebook, Skype and What´s App to get in touch and stay in contact with family members abroad. Devices are not in use if e.g. the manual is too difficult to understand. Devices are used as long as their functionality is guaranteed, otherwise they will be replaced. The female participants stated that male family members install technical devices. Informal caregiver would like to receive acoustic notifications for actions generated by the assisted persons (leaving the flat/house, coming home, etc.). Furthermore they require a secure connection to different family members as well as to health services, creating a kind of "family-network". This user group imagines the RelaxedCare system to consist of a mobile and a stationary component.
Assisted persons feel connected, affiliated and contented, if the informal caregiver shows solicitousness. In case of a (health) problem, assisted persons contact informal caregiver by telephone, but apart from this try not to become a burden. Autonomous living and self-determination are important for them. Aspects which transmit a feeling of security in everyday life are daily calls from informal caregiver, leaving home only with an attendance, living in a house with five parties, good working neighbourhood network or integration in family life (visits, walks, lunch, work).This user group is not very thrilled by the idea to manage new technical devices. A conclusion to this fact could be to enrich an already known device with new functionalities. The elderly also imagine that the RelaxedCare system would best consist of an easy to operate mobile and stationary device and also wish for a secure connection to their family and a health service centre. With respect to information gathered during the interviews in general the conclusion could be drawn that the RelaxedCare system should include entertainment functions to establish a positive emotional bond with the system.

Finalising the entire user research study and based on the findings of phase 2 - 5 visual Personas itemized by their demographic data, state of health, technology usage, leisure time activities, social interactions and product design criteria could be created.

Figure 1. Three-dimensional Persona-Card of Johanna Habermann

4 DISCUSSION

The overall findings from the first end-user requirements engineering phase highlight the fact that the two target groups are similar with respect to their psychological health situation and their everyday life routines. For both user groups, it is essential that a product is easy to understand and use. In order to support product acceptance, it is vital to design the product based on well-known behaviour patterns in the context of technology handling. But most important, the defined goal of the RelaxedCare project should be to design products that are adaptable to an individual's everyday life routine via the creation of an emotional bond through fun, meaning and personal significance.

The authors' approach was to research which methods - from qualitative social research or design research - would deliver the most useful information for the product design and technical development phases of the project in order to achieve the goal of creating an innovative user-inspired product. After having conducted the first end-user requirements phase of the project, the recovered output indicates the usefulness of the utilization of a combined approach of design research methods in conjunction with qualitative social research methods. The Assumption Personas method confirmed the motivation of its application as the findings reveal the existence of different mental attitudes concerning both target groups among the project team members of the project. Regarding the goal to innovate for real end user needs, this examination method is applicable to check up a project brief. The final project Personas were built after performing all research methods of the study. The Questionnaire enabled a first positioning of the target group in terms of their activities and their preferences regarding places and objects. The Show and Tell Method revealed a first valuable hint for an emotional user-product relationship, the carrying of a talisman. This information got further investigated in the successive phases of the study. The Focus Group method provided insights to the relationships between the two target groups. It revealed paradigms of what assisted persons and informal caregiver think about each other and demonstrated mental patterns regarding their mutual interaction. The method Cultural Probes investigated further emotional user-product relationships. The insights into the everyday lives of people from both target groups show that they use and display objects which in general create a positive user experience. The participants loved to surround themselves with objects which embody a positive memory to situations or persons. The goal for the Design Workshop was to broaden the awareness for the target groups in terms of emotional and haptic product criteria. Probably the most efficient task within the workshop setting for figuring out the emotional bond to a product was the presentation of a beloved and a hated personal object. The participants furthermore had the task to create collages framing their understanding of the nouns joy and relaxation. In general the authors observed that the participants enjoyed exercising some practical work within the workshop. The method Contextual Inquiry Interviews allowed further insights into the individual environment of the target groups. Although its tight and focused questions on technological items this method added subtle information to the observations in the homes of the test persons. Former gathered findings like e.g. favourite places, objects and relationships could be further questioned and refined.

Considering the need to find new inspirations for the visualisation of the findings gathered the idea of the 'Cube of Requirements' was generated, from which we expect novel stimuli for the subsequent product development process (see Figure 2). The Cube of Requirements represents the overall findings of the study. This approach aims at supporting a better memorization of the output of a study through the haptic experience as well as the emotional and hands-on engagement while playing with the cubes. It fosters active team discussions while interacting with the cubes in workshops and the possibility of creating huge combination possibilities for the interpretation of results in the following project phases.

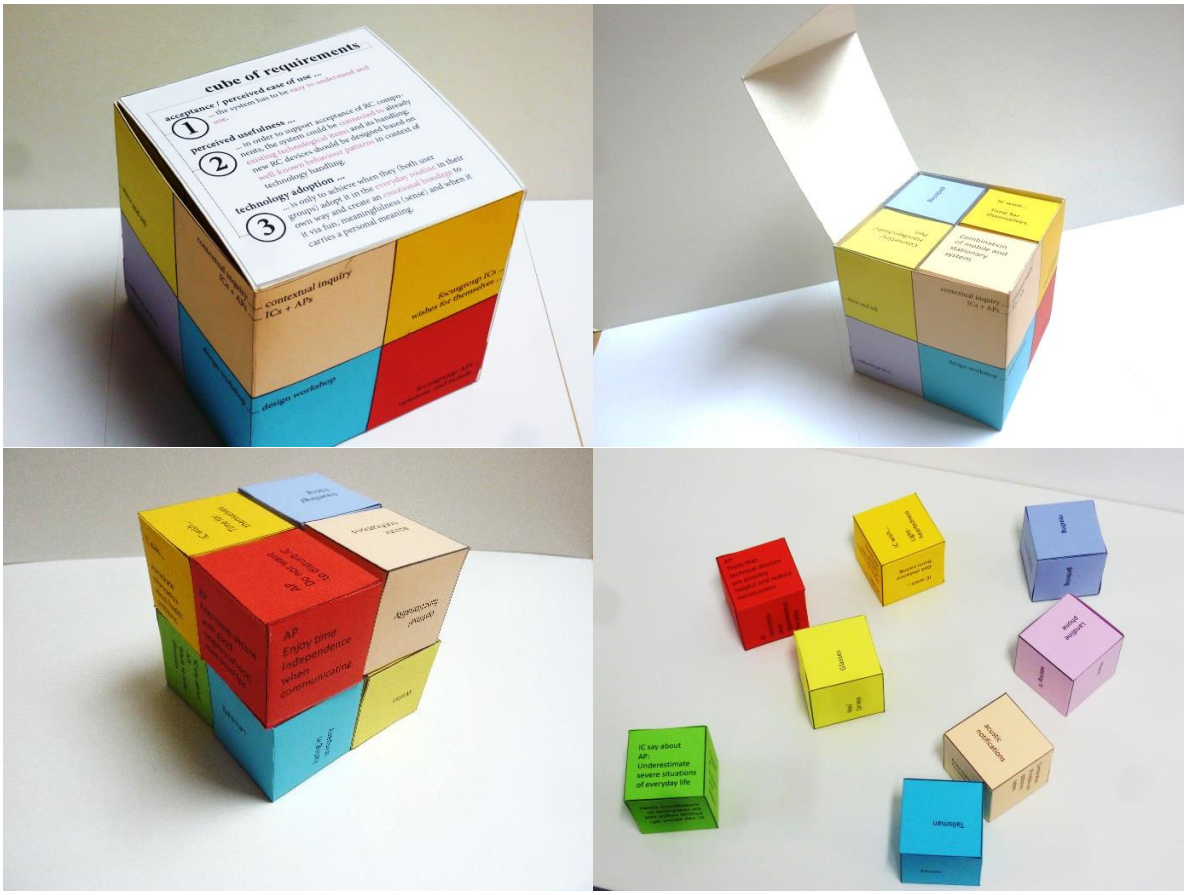

Figure 2. The Cube of Requirements

5 CONCLUSION

All in all the arrangement to divide the whole study into five phases where design research and qualitative social research methods were applied alternately has proven to be a fruitful approach. Each method revealed clues, which led to the refinement of the successive method, in other words the generated findings of each step enabled the authors to broaden the view on the target groups and to define the successive methods even more target-oriented.

"Different levels of knowledge are accessed by different methods." (Sleeswijk Visser, 2009) The call for a mix of research methods to assemble a trans-disciplinary research methodology is not new but still not adequately answered in practice. Summarizing the entire research process, the findings clearly indicate that nary information from the two research processes need to have been neglected and highlights the importance of the application of a trans-disciplinary research methodology. Although the appliance of a mixed methods approach in the context of AAL research projects was to date not a common practice the findings of our study encourages us to continue our work on a way to unify the two research methodologies. As described in chapter two, research approach, the research methods deriving from two research realms had been chosen for specific questions which needed answering to inform the product development process. The findings indicate that the combination of methods of qualitative social science in combination with methods of design research in generative sessions have the potential to offer insights in the area of knowledge what people know, feel and dream of. This can

ultimately lead to a possibility to extract tacit and latent knowledge of the target groups we design for and of course will be of great importance for a holistic project development in general.

Referring to the defined key questions of this study: Which methods offer the most useful information for a user-centred design project like this? and: Does the output deriving directly from the design research methods generate any additional value, which classical methods are not able to create? the authors concluded that according to the findings of the study methods of qualitative social science offer the most useful information to inquire factors for use and functionality of technological devices and methods of design research reveal most likely the best findings concerning the emotional factors for product design. Clearly, we are aware that methods of qualitative social science have the potential in itself to reveal detailed information about emotional product design criteria as well. But with regards to the empathy of the designer for the users he or she is designing for methods of design research open up a new field of experience in order to generate a broad and holistic image about our end users. In research and design practice the mix of both research methodologies had the benefit that through the appliance of methods of qualitative social science information vital for the whole product development process could be collected and through the use of design research methods we got the chance to get closer to and strengthen our emphatic understanding of both our target groups. Usually in AAL projects Personas are created in the end of a study based on its findings. In this project however starting with the application of the Assumption Personas method in the beginning of the study as a prequel turned out to be informative for the whole team of developers. This initial method of getting the team involved in the user-centred design process by questioning their own mental models enabled a deeper understanding for the final Personas of the project and supported the goal of designing and developing with real people in mind. The method Show and Tell offered the possibility to get involved with the target groups not only observing behaviour but learning how people interact with the objects they carry around with them when they are outside their homes in a real life setting. The method Design Workshop likewise enabled us as researchers and designers to broaden our fact based tacit about latent pieces of knowledge about the target groups by also taking the atmospheric intensity of such a workshop into account. The collected material through these methods enriched our understanding of the true user needs and interaction preferences in our product realm. With reference to the goal of this paper to test the synergetic potential of methods of qualitative social research and methods of design research, we conclude after the conduction of this study that the application of a trans-disciplinary research methodology offers great potential for a holistic product development process.

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