



ASSESSING USER NEEDS BY EXPLORING DAILY ACTIONS OF ELDERLY PEOPLE IN THEIR HOME ENVIRONMENT IN CHILE

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Abstract

Despite their increasing need for assistance, technical assistance systems for the elderly often fail. The aim of this study is to investigate the human-technology interaction in the everyday life of older Chileans. It focuses on household technology, which subsumes technical devices that are used to simplify and manage daily routine. The aim of the investigation is to identify the technology used and the usage practices. By conducting interviews with observational parts, some special characteristics of the target group are revealed and general implications for product development are derived.

Keywords: human centred design, human behaviour, user experience, technology for the elderly

1. Introduction

Nowadays, we are facing two major trends: On the one hand, demographic change requires more technology to serve in the assistance of an ageing society. The population of older citizens is growing more quickly than the fertility rate, a tendency that has consequences for social security systems, for the economy and the labour market, and for public finance (EU, 2016). Nations that provide support for elderly citizens in their autonomy may reduce the burden of their healthcare system and preserve the competencies of the elderly for their welfare systems. On the other hand, technical progress continues to offer enhanced solutions. Although both trends appear to complement one another at first glance, only a few breakthrough products successfully reach their intended demographic. Regarding the question of why this is the case, one must first consider some specific characteristics of the target group: firstly, one must understand that the elderly are not fundamentally adverse to technology, but have simply consolidated their everyday routines over a long period of time (Pongratz and Birken, 2015). They may therefore react with suspicion to the prospect of change in their routines because change primarily means the altering of their usual rhythm and the perceived restriction of their own sovereignty. It is, however, important for the well-being and independence of the elderly that they maintain their own capabilities for as long as possible. Additionally, by the time one reaches a certain age, each individual has already developed their own solutions for specific problem situations due to their still existing competencies, such that they no longer perceive them as such (Birken et al., 2016). Therefore, product development must address the concrete everyday practices of users. In order to understand the impact of a certain technology, it is at times more appropriate to examine people and their behaviours than it is to examine the devices themselves. It is not just about questioning what the elderly – as potential users of a given technology – want but who they are and why they might want it. It is a matter of better understanding their lifestyle in order to make new technology more easily adoptable and usable. This article seeks to contribute to the growing debate on user needs and product development by examining how elderly

people notice technical systems in their daily life. The aim of the current study is not only to investigate which technical devices the elderly use but also the dimension of cultural, social, and individual usage of the various people. Hence, the interaction between the human being, technical devices, and environmental conditions must be given attention. If one understands typical challenges in the daily life of the elderly, one can derive specific requirements for product adaptations or new product ideas, which meet their exact needs. A semi-structured method was elaborated and conducted in Chile in order to capture the situation of the daily life of elderly people in the home environment. The second section describes some main aspects regarding the relationship between elderly people and technical systems and possible approaches for the investigation of these interactions. The third section outlines the research methodology used to analyse the role of technology in the daily life of the target group. The fourth section will summarize the key findings in a topic-based analysis, and draw some attention to the main implications for product development. Finally, a conclusion and outlook for further research possibilities will be offered.

2. Background

Modern societies are gradually ageing more and more, and the growing population group is changing in their product requirements and needs. At the same time, however, it can be observed that specific products for the elderly are more likely to be rejected than accepted. One possible explanation lies in the development, which is often technology-driven: it is not human needs that form the basis of development, but rather considerations on how technical functionalities can be used to overcome performance limitations. Context of use and situations of human life and action, which in turn are decisive for product acceptance, are frequently neglected. However, individual motives for action and values must first be disclosed, because if someone's motive in using something is unknown, this need can hardly be addressed by a technical product.

2.1. Research perspectives

Every human being has an individual ageing process that brings with it different weaknesses and strengths. According to the UN (2013), the ageing group of the elderly starts at 60+. This definition is not helpful for describing the elderly in a qualitative manner: Some have problems with walking by the age of 65, and others run half-marathons at the age of 80. This example illustrates that there is no general solution regarding products for elderly people. One reason for these diverse ageing processes lies in the respective environment and living situation of the individual, a phenomenon which is affected by factors like wealth and social situation as well as biological and medical situation. Many modern technologies were not designed with consideration for these individual needs, weaknesses, and strengths of the elderly. Products often cannot be used effectively, because of mobility and cognitive limitations. Gerontechnology as a research field for technology and product development for the elder generation is primarily concerned with this mismatch between products and elderly people (Jakobs et al., 2008). The aim of this field of study is to support the elderly with technology and to give them the possibility to live as long as possible in an independent way and free from reliance on outside help (Fozard, 1994; Graafmans, 2016). Research on technological usage behaviour and the technical requirements of elderly people combines both engineering and social science approaches. The main goal of product development is to examine how products in general and technical systems in particular can be adapted in such a way that the elderly may operate them safely and easily (Biermann and Weißmantel, 2003). It therefore focuses on the mental and physical conditions of the elderly. This is just one side of the coin: Even the best-developed technical solution will not be used until the elderly find it useful. A stairlift, for instance, can certainly make it easier to climb stairs. However, older people may be more interested in maintaining their own ability to climb stairs rather than just getting up the stairs in the most comfortable way. In this case, the engineering designer recognized the physical problem but did not develop an adequate solution because he defined and addressed the problem improperly. According to the ISO 9241 standard (DIN ISO 9241-210, 2011), design should be based on an explicit understanding of users, tasks and environments and should be adopted and refined by user-centred evaluation. However, the way in which these criteria are implemented is not concretely formulated. The starting point is principally a product or at least a product idea (Essén and Östlund, 2011). User requirements

and needs are hardly introduced by the user himself. Moreover, the understanding of the user is often based on stereotypical user images without the engineering designers being aware of it. User involvement is thus important to take into account for the improvement of product concepts and of the capabilities of innovation and product market performances (Mao et al., 2005). User experience research aims at emotional effects that arise before, during, and after product use. Since a positive usage experience is based on the fulfilment of certain basic human needs, the link between needs, usage, and product use is explored (Pollmann et al., 2017). These social aspects can be addressed by approaches from the social sciences, which consider the user's needs and behaviours as well as the acceptance of technical products and which investigate the interaction between the elderly and technical systems in their daily life (Mollenkopf et al., 2000; Tully, 2003). As a consequence, interdisciplinary research projects in this field are increasing recently (Paetzold et al., 2016).

2.2. The elderly and technology

At present, assistive technologies are gaining visibility under the collective terms Ambient Assisted Living, Companion Technologies or Lifelogging (Biniok and Lettkemann, 2017). Assistive Technology is often used as a generic term for assistive computer technologies such as screen areas, speech input, magnification software, on-screen keyboard, and similar products in the IT sector. These technologies are marked by intelligent technical design, flexible mechanical constructions, and adaptive programming to make life easier and simpler for everyone. In particular, they help the impaired to lead as independent a life as possible. However, numerous studies have shown that a wide range of support services provided by new digital technology have so far been insufficiently accepted by older demographics (BMFSFJ, 2005). While “classic” household technology, such as dishwasher, washing machine, electric cooker, iron, etc., is predominantly assessed and used positively, new information and communication technologies are sometimes rather hesitantly accepted (Statistisches Bundesamt, 2011). Reasons for this trend comprise views regarding the lack of usefulness of new technologies, prejudice toward such technologies, and overestimation vis-à-vis the incurring costs (Docampo Rama, 2001; Melenhorst et al., 2006; Kampmann et al., 2012). Krämer (2000) describes this situation as a kind of threshold: On the one hand, there is a lack of a broad public discussion about the possibilities for application and use of digital technology, and on the other hand, the reservations are still relatively high on the part of the user. In addition, the development of technical equipment has so far in general been insufficiently geared to the specific needs of elder generations. In general, the elderly want to maintain or strengthen the necessary skills and abilities for their routines (Paetzold and Wartzack, 2012). The development of corresponding systems presupposes the knowledge of competencies and abilities, their limitations, and the knowledge of the mechanisms by which these competencies are formed. Therefore, it is not sufficient to focus solely on the sensory, motoric, and cognitive deficits of the user (Paetzold and Pelizäus-Hoffmeister, 2016). Marketing experts have now recognised the market of the elderly as an attractive field, but manufacturers still seem to be underserving it. At the same time, research into the usage wishes of elderly people come along with some challenges.

2.3. User research methods

Since there are translation barriers in both directions, it is not always easy for the engineering designer to obtain the information from the user that he really needs. Knowledge can be categorized into four levels: explicit, observable, tacit, and latent (Sanders and Stappers, 2012). Explicit knowledge is conferrable by talking with each other. It is the easiest way to share knowledge. In addition, ideas and thoughts can be identified by observing potential or current product users and noting their reactions. Observed interactions are not always self-explanatory, their understanding is based on an implicit knowledge base that needs to be shared by the observing and the observed person. Sometimes people do not dispose specific knowledge themselves, but rather can form an opinion out of other experiences. This kind of latent knowledge cannot be revealed simply by asking. The needs and values of people are mostly part of tacit and latent knowledge. One possibility to get some information on these levels is to combine the thinking process with a concrete event or situation in the life of potential product users (Michailidou et al., 2013). However, simultaneous verbalisation does not always come naturally, and participants have to be trained in it. Introspection, on the other hand, is time-consuming and requires

discipline and motivation on the part of the participants, something which cannot always be guaranteed (Ottosson and Sterten, 2014). Social media based user diaries seem to be a promising process improvement because it allows real-time feedback and user interaction (Bae et al., 2015), but given that the target group is largely uninvolved in social media, their use does not seem appropriate for this study. Research on technology acceptance aims to evaluate the perceived usability and usefulness of a system by potential users (Davis, 1989). Mostly, this happens based on Likert scales, which, however, does not allow insights as to how and why the respondents reach their assessment. Supporting technology must be based on satisfaction with existing solutions, because its scope is an expression of a real need (Pelizäus-Hoffmeister, 2013). Otherwise, technology will be evaluated as not helpful and thus rejected. Needs are not always able to be verbalized successfully. A central challenge is to transfer the concept of functionality to the description of the human being in order to create the preconditions to differentiate the application scenarios for future products by bringing together different perspectives (Walter et al., 2015) Therefore, the immediate life situation of the elderly must become the starting point for meaningful product development. The life situation includes practical lifestyle, resources and restrictions on the dimensions of life situations, and potential motivations for the use of technology. From these, problems arise in various fields of activity, which form the basis for the development of technical supporting systems.

3. Research methodology

The development of technical supporting systems for the elderly is often technology-driven and fails to meet the challenges of a self-determined lifestyle in old age. Consequently, the products are lacking in success. Even many scientific approaches, which are intended to contribute to a stronger user orientation, also have specific deficits in this respect, as they do not begin until late in the product development process. Against this backdrop, a research strategy was developed, which aims to identify the needs and wishes of the elderly in this respect based on an analysis of their everyday lifestyle.

3.1. Terms and research questions

Since lifestyle is expressed in routines and habits, the central challenge is to make these practices the object of conscious reflection in a dialogue between the researcher and the ageing individual as a research partner: how do the elderly notice technical systems in their daily life? To concretise this research task, only technical systems in the home environment, which are used within the daily routines of the elderly, were considered. Daily routines can be understood as regularly recurrent processes in day-to-day life, excluding job routines (Lenk and Ropohl, 1978). This study focuses on household technology, which subsumes technical devices that are used to simplify and to manage daily routine. The investigation aims to identify the technology used and the usage practices. The question, which has to be asked for all identified practices, is whether they appear to the research partner to be difficult, arduous or problematic and what role technologies play in dealing with them. From this follows whether they could serve as a possible field of application for the development of technical support systems.

3.2. Target group and sample

According to the research question, the target group for the investigation are elderly people. Initial contacts with the target group were made via the Universidad Bío-Bío and the Iglesia Evangélica Luterana, both located in Concepción. It was necessary to use different communication channels in order to ensure that the sample reflects the heterogeneous lifestyles of the elderly. The church is a good contact point, because people feel safe there and become less frightened when approached. Since a high level of education correlates with a higher affinity for technology (Jakobs et al., 2008), contact with the university should also be used to attract members of the target group to the study. The study aims to highlight the necessity of using daily routines as a starting point for new development. It can thus be understood as kind of a litmus test regarding the outcome of the methodology used. The main idea was not to attain complete representativity but to gain rich qualitative insights. To that end, a small sample, which is investigated comprehensively, appears sufficient. In total, the sample consists of eight participants living in the metropolitan area of or directly in Concepción. Their age is between 68 and 89

years, six are female and two are male. The education level is subdivided into three categories: low (without any vocational training), average (absolved a vocational training after school), and high education levels (completed academic studies). Some participants are financially supported by their children and families; others own multiple houses. Due to space limitations, no comprehensive individual case representation can be made here. Therefore, only single succinct quotations of the participants, which were anonymized with the abbreviations P1-P8, are reproduced below.

3.3. Data gathering

As mentioned above, it is not always easy to get access to the full range of information simply by inquiring. An “A-Day-in-the-Life” study is a type of ethnographic research in which a user is accompanied and observed by the researcher throughout a typical day. The researcher is able to observe moments that are so routine to the user that he or she is not even aware of them. This tempers the bias that the user only tells stories he or she determines to be interesting, but which may actually be less relevant or impactful. The purpose of an A-Day-in-the-Life exercise is to demonstrate the various product touchpoints with a user within the context of their life. This will give insight into user behaviors, needs, goals, and the amount of focus that they can give the device at a given point in time. In accordance with time constraints, the decision was reached not to spend an entire day with the elderly, but instead to allow them to summarize their daily routines during a conversation. Sanders and Stappers (2012) suggest a handout to guide the participants through this kind of investigation. First of all, the participant should talk about their various activities in the daily routine of a specific day. Following this, he or she should evaluate whether she or he (dis-)liked the activity. Furthermore, the participants should explain the reasons for their mood. After this approach, the peoples’ needs and values can be reproduced without asking them directly, a process that avoids social biases. For the present study, this was adapted to focus more on the technical user experiences of the participants (see Figure 1).



 bath breakfast household cooking lunch hobby grocery dinner TV reading 
Please note your own daily activities. How did you feel?
Please note the technical devices used. Was it a good or bad experience?

Figure 1. Participant sheet “Daily routine”

The terms located in the white box represent some standard activities in order to help the participants to recall their own daily routine. Firstly, they were asked to add relevant times and activities to depict their own daily routine. They were asked to take notes and drawings in the yellow activity box. In a subsequent step, the elderly individual was asked to reflect upon the role of technical devices for the named activities. Their experiences were written in the orange box. The notes in the text boxes ensures that no information was lost during the interviews. Either the interviewer can ask further questions to these subjects or the elderly remind themselves of open topics during the following interview phase. In order to gain a deeper understanding of the processes of the daily routine of and the technical devices used by the participating elderly person, a semi-structured interview guideline was employed. Furthermore, during the interviews, which were held at the participants’ homes, they were asked, whether they can demonstrate how they interact with a technical device. The observed behavioural patterns were also granted critical analysis in the conversation. For further analysis, the conversations and the observation protocols were transcribed verbatim.

4. Results

The analysis was conducted by following the Grounded Theory (Glaser and Strauss, 1967). Grounded theory is less a theory than a research strategy in order to discover a theory based on empirical data, which is collected by theoretical sampling. Even after the collection of the initial data it allows for the adaptation of the methods for gathering further data based on preliminary theoretical conclusions. The data gains structure from different coding loops: from open coding to axial coding to selective coding (Strauss and Corbin, 1990). This reciprocal gathering, evaluating, and analysing process ends if further data brings no further insights and the previous statements are no longer influenced or modified by the ones following them: in this case, the theoretical saturation is reached (Bowen, 2008).

4.1. Main findings

The main results of this research are presented corresponding to the research steps: firstly, a brief descriptive analysis of the results gained during the interviews and observational parts is given. This description follows the different dimensions of technological usage behaviour, which was revealed during the interviews. In a second step, the study's main outcome – the implications for product development activities – will be elaborated through a topic-based analysis.

4.1.1. *Technology and challenges in everyday life*

Interestingly, as they were introduced to the topic, nearly all elderly individuals initially tried to convince interviewers that they were the completely wrong person for the participation in this investigation because they do “not use any technical devices” (P2) and are “very simply living and frugal” (P1) people. It was thus first necessary to define the term technical devices in order to reduce fears of contact. As they thought of technical systems, which they use during their days, three devices were always named: computer, television, and cell phone. Other home technology was not mentioned until they were given the example of an alarm clock beside their bed. Beside the television, DVD and video recorders are also present, but not used very often. Nearly all participants enjoy reading books, whereby only P5 owns an e-book reader: It was a present from her children, and she did not even know that such technological possibilities exist. Surprisingly, nearly no kitchen devices were named spontaneously. It turned out this was the case, as these are mainly or even exclusively used by the staff. One device, which was mentioned by all the elderly are the heating units of the houses. In Chile, most houses are not well-insulated, and therefore, without permanent heating the houses are get cold very quickly during winter. Solutions include heating with gas, paraffin, electrical radiators or wood-stoves. Central heating is used in two of eight cases only, because “it is very expensive” (P8). Family members installed electrical heating devices in the houses of P3 and P7. The new device was never explained well, so the elderly reported not to know how they could set it according to their needs: in P3's case, it turns off automatically at seven in the morning and they cannot change the times on their own. This story initiated the question as to whether the elderly have any problems with technical devices or general activities. The participants reacted in two different ways. P1, P3 and P6 reported several problems in their daily routine whilst the others claimed not to face any problems. During the observational portions of the interviews, they admitted that they also face troubles but have already found solutions to cope with them. P5, for example, needed more than five minutes to carry two plates and the cutlery into the kitchen: she uses a cane, so she is only able to carry one piece at a time but denied the need for help. Most of the difficulties reported were related to new technical devices like a lawnmower or clipper, which the elderly commonly do not know how to use. P4 and P6 reported not to understand big instruction manuals, because these mention different technical terms, which are often translated very poorly. The only possibility to solve this without external help is to “try out the different functions” (P4) themselves or to merely live with the issue that the machine was designed to fix. In Chile, it is common practice to employ personnel who care about everything with which the elderly have difficulties. The relationship between the elderly and their staff is described as very familiar: They also support the elderly in intimate situations, such as daily hygiene. Besides family members and staff, neighbours are also “quickly available” (P2), whilst craftspeople and “technical service staff [are] not that dependable” (P7).

4.1.2. User habits and technological skills

In all cases, only the housing staff use most of the devices. Sometimes their help compensates for a deceased partner. P2 for example needs help from a gardener once a week, because she feels too weak to do all the work alone: she used to do the gardening together with her husband. Conversely, a division of roles was observed for two siblings who are sharing an apartment: P6 loves cooking and is thus responsible for the kitchen. P7 is responsible for the cleaning and the washing that does not pertain to the tasks covered by the house cleaner. However, if any problems with their tasks occur, they help each other and solve them together. P7 is also responsible for the telephone. In contrast to her brother, she uses a cell phone. On the other hand, her brother operates the computer and manages their joint email address, the printer, and the camera. The question as to whether they could imagine switching these roles was answered quickly: they had never thought of it, because they are both happy with the current situation and “do not have to know how every device works” (P6). This type of separation of roles in the use of technical equipment was observed for the married couples, as well. Often, there is one in charge of certain devices: One who “loves driving” (P1) and the other without a driver license (P2), one who is always answers the phone (P4), and so on. This behaviour becomes a challenge when the tasks in question suddenly have to be dealt with on an individual basis, because this division of labour also explains the inexperience of older people with many devices. P8 described herself as “completely technically incapable”. She often forgets “how things work and what the operational steps are”. She emphasizes the strong need for writing down each step if someone explains it to her. On the one hand, she wishes to stay in closer contact with her family, and she therefore wanted to learn to use a computer. However, P8 “could not find anyone who could help” her and explain things the way she needed it, so she has never tried it. The participants who had to deal with a certain type of technology during their working life are more likely to learn new things. They already know the advantages of some technical devices and want to benefit from them in their private life, as well. P6, who first avoided dealing with a computer, once met a handicapped person at his workplace. For this person, the only way to communicate was with his computer. P6 thus learned how to run it. The more he learned about the system, the more positive user experience he had. Today he is very happy that he “was forced to learn the functioning” (P6), and he uses his computer “every day”. Nevertheless, it is remarkable that the question as to whether the participants would like to buy new technical objects was, answered „no“. The participants are rather frugal and see no need for being current in terms of recent technologies. On the contrary, they use a technical device as long as possible. They only replace it if it is irreparable. In multiple cases, the reason for this attitude lies in negative experiences with new devices. Due to these, the elderly feel unsure about and are generally unreceptive to new devices. Financial aspects were mentioned only incidentally (P2, P8). The participants prefer to invest their money in trips to see their families rather than in buying new devices. This strong meaning of social contact is also reflected in dealing with tasks that they cannot handle themselves: instead of buying technical devices to make their daily tasks easier, they prefer to implore housing staff to take them over. In general, most of the participants classify themselves as open to new technical devices, but not as qualified for the usage.

4.1.3. Attitude towards (modern) technology

Contrary to the assessment regarding their user skills and their need for modern technology, six of eight people are connected online with their families and friends via Email, WhatsApp, or Skype. It is worth noting that the necessary technical equipment was frequently introduced by friends or younger family members. In the rarest case (P3), these devices were purchased on account of their own initiative. In most cases, the children or friends think that they may need them. The main concern of the children is to stay in contact with their parents more easily, so that they can come to assist them more quickly in the event of an emergency. Furthermore, the elderly can participate in the life of their children via social media even if they live far away. P5 uses WhatsApp for daily communication with her three children, who are spread over the entire continent. She referred to her tablet computer, which was purchased and sent by her daughter, as “her life”. The children are sending her videos and pictures, but she also organizes her financial affairs via tablet. As Chilean TV programs include rather lengthy advertising breaks, some participants use the online media library for watching their favourite television series. Nevertheless, a certain rejection of the new technology can be observed: even if they check their emails

daily and use a regular cell phone, some participants do not see an advantage in using a smartphone. Its usage is perceived as “time consuming” (P4). This impression follows the perception that in public buses, nearly everybody is using his/her smartphone the whole time and “people are not talking to each other anymore” (P4). Another contradiction showed up in the conversation about alarm systems: P1, P2 and P5 own a complete automatic alarm system for their houses. These systems are connected with a 24-hour control station including motion detectors and magnet contacts. However, as they are complex to activate and sensitive in their operation, they are usually turned off. Several times, there were false alarms triggered by cats or dogs. However, because of the badge of the alarm system company at the fence, the elderly are still convinced of its usefulness. It is remarkable that half of the participants were talking about the current computer generation and that new technology with its associated devices makes “the big difference” (P8) between their own and their parent’s generation. In contrast to themselves and their older children, younger children, and grandchildren already grew up with these devices. This is seen as the reason for the different behaviours towards modern technologies and technical devices. Despite the enormous technical capabilities, most participants are quite content with living in their generation. They rarely see a need for the opportunities, which are introduced by new technologies. Moreover, they are sceptical about future development of some technologies, regarding the international armament with war drones in particular (P4). On the other hand, most agree that in the civil sector, further technical innovation could help to attain an even better and easier life. However, they predominantly regard this as relevant for the following generations.

4.2. Implications for product development

It emerged, that the observed differences in the users’ behaviour depends on specific combinations of various factors such as the age, overall technical interest, and affinity of the individual people. New things are generally viewed with a certain amount of scepticism, and their usefulness is initially questioned. The effort to learn something new is perceived as disproportionately high compared to the expected profit. Following the coding from the data gathered, some generic implications for successful product development can be made.

4.2.1. Adaptability to daily practices

In this study, all participants explained in detail the various activities in their daily routine. These routines are very structured, most participants have allotted exact time slots for doing a particular activity. The daily routine may be seen as a daily schedule that gives them a feeling of safety and reliability in their daily actions. If there are any irregularities, for instance, by means of an unknown person or a new technical device, they can become nervous and feel unsafe. Furthermore, it is conspicuous that main parts of their day take place in their own home. They leave their home environment only if they have fixed appointments – such as for example the flute ensemble in the church. The participants with physical restrictions completely try to avoid leaving their home. At home, they are feeling safe, because it is a known environment. Therefore, they prefer that family members and friends come visit them instead of the other way around. Technical devices especially should be integrated slowly into their daily routine. It is necessary, that the devices show an obvious advantage for the daily life of the elderly. Otherwise, the systems are hardly accepted and are quickly dismissed as pointless. The participants adapted their daily routine to their physical and mental conditions. In two cases, the elderly use only three or four rooms on the ground floor of their big two-storey houses for living. This is linked to the fact that they are restricted in their mobility. This spatial distribution was already considered in the planning phase for the house and the move-in fifty years ago. Even the rooms they use are adapted to their special needs. The participants are quite content to take no risks at all. However, fundamental parts of their daily routine, which they are unwilling to change or miss, are influenced by modern systems. These devices were developed and launched mostly during their middle age. This explains their attitude towards the new technologies: given that the technical systems were not necessary in their earlier life, they see most of them as a kind of disruption in their daily routine. Nonetheless, attempts are made to integrate new technical systems in some parts of the daily life. The elderly are open-minded especially regarding communication technology. They are fascinated by the fast video telephone that reaches to the other side of the world. Once integrated into everyday life,

technology and technical devices are perceived as completely natural: the old technical systems, as for example, alarm clock, laundry machine etc., were not mentioned in the interviews by the elderly themselves. These devices are by no means unimportant for their everyday life, as they usually support their daily routines. However, the reason for this omission lies in their familiarity with the respective devices. These usage habits are no longer consciously reflected by the older ones, they are fully integrated into their lives.

4.2.2. Education in dealing with sensitive target groups

Elderly people are not only reticent about new technologies. In order to explore their daily routines, it is advisable to question the elderly in their own homes. The advantage is, on the one hand, that the interviewer can see the existing devices and make them a subject of discussion. On the other hand, she or he can directly observe some routinized interactions of the participants with their technical devices and thus understand the existing problems in a comprehensible way. However, the ageing individuals in question were not so enthusiastic about the idea of letting strangers into their homes. Some were generally afraid of one-on-one talks; others were afraid of the subject matter, and the next few were afraid of longer conversations and demonstrations. Many people were therefore reluctant to participate in this study. Even after committing themselves, they only gained confidence after a longer period of getting to know each other. It turned out that the need of a longer starting phase with innocuous small talk about the weather before the conversations could be directed towards their personal daily routine. The same thing happened with the graphic for the daily routine: actually intended as a relaxing introduction, some participants felt intimidated by such an "official document". Others had difficulties with the size of the coloured text boxes due to poor eyesight. The interviews were also influenced by hearing impairment: on the one hand, the interviewer had to speak very loudly, and on the other hand, he had to reformulate many times, which affected the entire flow of conversations and in some cases caused discomfort. The interviewer therefore had to act very sensitively and cautiously with the older interlocutors and bridge interruptions by the staff present, as well.

4.2.3. Minding the relationship between buyer, user and owner

The relationship between the participants and their employees goes beyond a formal relationship between employer and employee. Not only does the staff take care of the daily household chores, but they also serve as a conversation partner and confidant. The most important conclusion of this study is the importance of the personnel for the operation of technical equipment: If there is a problem with the vacuum cleaner or the washing machine, the participants pass this problem on to their personnel. Although the elderly people would like to remain independently responsible for their household as long as possible. If there are any problems, the staff members who are already in the house are the first point of contact. The Chileans also show a great deal of solidarity with their own family: in the poorer sections of the population, older people quite frequently live together with their families in a single house. In these cases, the family is available 24-hours a day and takes over the work where older people have problems. There is always someone who will help them or complete the tasks that need doing. This is one of the reasons why many participants stated that they do not come into contact with technical equipment and therefore have no difficulties regarding interactions. The participants do not have to deal with these technical devices. However, the resulting dependency only becomes apparent when they have to interact with a technical device alone for various reasons. Ageing individuals generally do not desire new technical equipment, technical improvements, or innovations. The staff, the neighbourhood, and the family are the most important parts of their lives. The personal advantages of a housemaid and one's family cannot be replaced by new technical equipment. Instead of just improving an isolated situation for the elderly, it is also necessary to develop new technical solutions to the problems that arise from the constant external aid provided for them.

4.2.4. Introducing Product-Service-Systems

Above all, personal contact plays a significant role in the life of older people, for example in weekly shopping and the related meetings and exchange of information with friends and acquaintances. However, they are initially less open to strangers. The dissatisfaction with the service personnel of

various manufacturers was also often discussed. When it comes to solving problems with a technical device or to familiarizing oneself with a new purchase – if no familiar person is present – their only alternative means of learning is often the user manual, which for reasons stated can also present an issue regarding operating instructions. On the one hand, it is the general lack of understanding regarding the poor translation of technical terms in the manual and on the other hand, older people often simply give up due to the thickness of the manual. This leads to frustration and a certain amount of uncertainty, which affects the entire user behaviour and ultimately leads to a rejection of the device. Customized usage instructions can be particularly helpful in the start-up and adjustment phase. The individual steps for starting the device or in case of problems should be described in a simple and illustrated step-by-step sequence. Most of the participants stated that they had no technical understanding whatsoever. They already feel overwhelmed and inferior even prior to approaching new technologies. Here, it seems sensible to bring them together with a trustworthy specialist, who will help them with the first application on a trial basis. It is important that they have a reliable, competent, and accessible contact person with whom they can build a trusting relationship.

4.2.5. Rethinking design

In general, technical devices will be used as long as possible, although they are partially broken, do not work correctly, or are difficult to operate. The elderly are mostly satisfied with a solution that helps to circumvent the occurring problem. Furthermore, they develop strategies to live with this problem instead of trying to solve it. This self-defeatist attitude has several aspects: predominantly, the elderly do not have a better solution. If they buy a new system, they will have more trouble installing it than if they use the old one. Furthermore, they see no guarantee that new devices will work better. In addition, many times they do not trust modern technology. Moreover, they are frequently unaware of what new technical devices are available. The products are often too complex, and they do not see the benefits of the devices. Contrastingly, their children or friends recognise these issues well and therefore buy them for the elderly. Following the purchase of the device, the consumer, who mostly knows exactly what she or he must do, completes the basic set-up. They likely use the same or a similar product and are familiar with the structure and the handling of it. The set-up process tends to go rather quickly and smoothly. Yet the elderly feel unsure about it, so they avoid using it and thereby never come to understand its functions. The opposite is true when older people enjoy having a device and, above all, when they can use it for staying in touch with their family. Ageing individuals accept the initial difficult operation of modern communication devices and are willing to learn how to use them. They therefore have their own experiences and are not afraid to solve a problem on their own. For the elderly, it is crucial to enter this phase of interacting with a new device. If the elderly do not achieve this positive situation on their own, it is important to receive external help. The device itself should be able to support and moderate this interaction. Some devices should be designed exclusively for use by the elderly. It may be helpful if the devices look like the previous ones that they already used. Nevertheless, frequent support may be required until older people understand the basic operation of a system. This strong need for support should be included in the requirements analysis.

5. Conclusion and outlook

The aim of this research project was to investigate the human-technology interaction in the everyday life of elderly Chileans in order to derive clues for the target-group-oriented product development. In general, participants were open to almost any kind of technology - as long as they did not have to use it themselves. Thus, various technical devices are in the Chilean households, which are being serviced by other family members or the house staff almost exclusively. A central finding of this study is the disclosure of the special role of the house staff: Due to the personal support from family, neighbours and domestic workers, there is hardly any need for assistance by means of technical systems. Technical systems are seen as competing with personal help, which go beyond concrete support of limited functionality and additionally address social needs. Most families are spread out throughout Chile, so using modern communication technologies is necessary to stay connected. When the benefits of a given technology are known, older people are willing to learn how to use these devices. Nevertheless, they often do not dare to buy such devices themselves. If they get them as gifts by their loved ones, it is

necessary to thoroughly instruct them in their use. Only when older people accept the devices and know how to use it, the usage barriers are overcome and the devices will be integrated into everyday life. This studies' implications for product development will serve as a basis for formulating and developing concrete product ideas for the elderly in further investigations. The focus could be on how technical systems have to be developed in order to be used by both, the supportive person, i.e. family or staff and the elderly themselves. To make the findings even more reliable, this study should be repeated to a representative extent.

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