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Designing for Inter/Generational Communities

Proceedings of the 3rd International Workshop
“Fostering Social Interactions in the Ageing Society”,
COOP Conference 2012

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Impressum

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Designing for Inter/Generational Communities

Proceedings of the 3rd International Workshop “Fostering Social Interactions in the Ageing Society”, COOP Conference 2012

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Abstract. Demographic change has stimulated ICT development and research in different fields, such as CSCW, HCI, or the AAL (Ambient Assisted Living) domain. Enabling ‘aging at home’ has become a main target in many nations due to economic challenges and demographic changes. ‘Aging at home’ is situated in a tension between keeping ones’ autonomy and social inclusion. This strong socio-cultural embedding of relationships in higher ages contoured by individual and societal norms and values require socio-technical and user-oriented research approaches common in e.g. the CSCW community. However, due to the extremely heterogeneous target group in terms of technology affinity and acceptance as well as individual needs and conducts of life, it is time to reconsider common research methodologies, technological solutions and research paradigms. The workshop aimed at exploring technology design research, focusing on the particular

needs according to technology use and access in the field of home-based social media. The workshop therefore aimed at bringing together researchers and professionals in the field of ICT for the aging society to outline a roadmap for future ICT research on fostering social interactions for an aging society.

1 Theme of the Workshop

Ageing in place is increasingly emphasized as a preferable alternative to institutional care. Although it offers the potential of both practical and psychosocial benefits, the reality of remaining in the community in later life can be problematic. The tension between autonomy and social inclusion is an important issue for each human being, however balancing this boundary gets harder in higher ages due to physical, mental and social changes in the process of aging. Holding relationships or creating new social interactions for elderly people is strongly contoured by individual and societal norms and values. A primary concern for this population is the loss of companionship, which can contribute to isolation, depression, and decreased socialization. The best weapon against senior isolation is family contact and generational social interaction, but this is made difficult by living arrangements. Thus, new opportunities exist for domestic technologies to support socially oriented activities for older people, their families and peers. This clearly points to an opportunity for socio-technological and user-centered solutions to support independent living for seniors. However, due to the extremely heterogeneous target group in terms of technology affinity and acceptance and individual needs and conducts of life, there is a need to reflect our recent methodological tool boxes, aimed technical solutions, and research paradigms.

In terms of lacking appropriate research paradigms, we face the shift of ICT from the office to home environments. The extension of the origin CSCW research domain of office work towards other domains, such as the home, benefits from a stock of concepts and foci in CSCW research, such as the design for context and social awareness (e.g. Crabtree 2003). There is also a range of CSCW research in the application domain of the home with different foci, such as home care (e.g. Palen and Aaløkke 2006, Mamykina et al. 2004) and family life activities and coordination in the home (Crabtree and Rodden 2004). However, the occupation with the new research domains beyond the workplace reveals the need for acknowledging the unique demands of domestic technology appropriation and use. Rather than designing for efficiency and utilitarian pursuits, home technologies aiming at fostering sociability, inclusion and social awareness need to take into account different underlying design aspects, like designing for recreational or ludic experiences (Gaver 2006). Besides, the perspective on the social every-day life of the elderly, their social interactions, and related ICT

support is – in contrast to its relevance – a relatively new research issue. This stresses the importance of ethnography-based and participatory design methods for informing domestic ICT design, which will be able to address the specificities and needs of every-day life and especially social wellbeing of the elderly, based on interaction, coordination and collaboration between actors of the elderlyes' networks, such as neighbors, friends, peers, remote family members, care providers, etc.

Supporting every-day activities within home-environments also reveals some of the challenges and opportunities for approaches to social-technical design and evaluation that focus on the longer-term aspects of innovation, appropriation and use in real-life settings, such as Living Labs (Niitamo et al. 2006; Budweg et al. 2011). Living Lab approaches have also proven to be successful to include people with low technology affinity into the design process. New technologies can be tried out in real conditions, and by this possible ways of integration of ICT in the every-day structure and the individual socio-cultural environments get transparent and discussable between user groups, researchers, and industry. To open up ethical issues around home IT for the elderly is another important benefit of the Living Lab methodology (www.openlivinglabs.eu; www.ami-communities.eu; Hlauschek et al. 2009).

In terms of artefacts and technologies, the workshop aimed at gathering research on systems fostering social interactions for aging at home from a wide variety, such as Social/ Interactive TV (Rice and Alm 2007), also concerned with the design of innovative input devices for elderly persons. Here, the bandwidth is from easy-to-use remote controls over intelligent furniture to other interactive devices in the home, such as interactive picture frames. Another branch of ICT are social media for social support (Caplan & Turner 2007; Barnes & Duck, 2007), such as online communities with special focus on social support for the elderly (Tixier et al. 2010) and social technologies supporting awareness as well as other technologies such as smart environments, playful interaction technologies as well as games supporting social interaction.

2 Dimensions of Designing for Inter/Generational Communities

Researchers from France, Germany, Italy, and Slovenia took part in the third international workshop on *Fostering Social Interactions in the Ageing Society* with special focus on *Designing for Inter/Generational Communities* which was held in conjunction with the *10th International Conference on the Design of Cooperative Systems (COOP 2012)* on May 29th 2012 in Marseille, France. Several dimensions of designing for inter/generational communities were discussed, such as:

- What are successful approaches for the analysis and design of systems fostering social interactions in an ageing society, such as Social TV systems, SmartHomes and SmartFurnitures?
- What do we learn from ethnographic studies on people at home in an ageing society?
- Can approaches to playful experiences and games for elderly or in inter-generational environments be helpful?
- What is important when doing research on the design and the evaluation of awareness support and on the appropriation within communities and home environments?
- What are good examples of Living Lab and real-life, longitudinal oriented approaches to designing and evaluating social systems?

3 Perspectives on Designing for Inter/Generational Communities

Seven presentations discussing various aspects in respect to inter/generational communities and approaches to ICT design were held by workshop participants. The results of each research project are being collected here either in form of a research paper or a position paper.

Federico Cabitza and Carla Simone highlight in their paper *Online Lifebooks: Narrations of lived lives to foster inter-generation exchange* the problem of socially imposed stereotypes of elderly people which often guide our thinking in design. With their application “Lifebook” the authors aim at the promotion of the creation, sharing and co-construction of life-centered narratives which stress elderly peoples’ competences and potentials for content production in intergenerational interactions.

Dominic Depner reflects in his position paper *(Non-)Normative Freedom and Technologically Mediated Well-Being* dedicated goals of AAL research and development of fostering freedom and autonomy for elderly people. He pinpoints to the need for a critical stance in setting-up respective normative design goals.

Christian Parra co-authored the paper *What’s Up: Fostering Intergenerational Social Interactions* of *Marco Dianti, Christian Parra, Fabio Casati and Antonella de Angelli*. The paper presents an evaluation study of an innovative approach to a social interaction platform which aims at being usable and accessible to the oldest group of users by providing a simple user interface.

Johanna Meurer and Rainer Wieching reflect in their paper *Motivating elderly people to use fall preventive exercise training games at home: Are community based ICT features always a good choice?* experiences from a participatory design study. They highlight practice perspectives of seniors and reflect on how to

integrate them into a design approach for a training system for fall prevention and detection.

Cornelius Neufeldt and *Claudia Müller* accomplished a participatory design study in a residential home. Their study *Social Interaction through Participatory Design in a Residential Care Home* points at challenges in requirements analysis and support of adoption processes of a large screen display for different stakeholders, such as the residents, the staff and relatives.

Patrícia Silveira, Florian Daniel, Fabio Casati, Eva van het Reve and *Eling D. de Bruin* present a study on social and motivational aspects of elderly peoples' physical training for fall prevention. In the paper *ActiveLifestyle: an application to help elderly stay physically and socially active* they reflect the challenges of motivating elderly to exercise autonomously at home and provide a virtual community solution which helps people to adhere to their training plan by means of social motivational instruments.

Emilija Stojmenova, Tomaž Žohar and *Dejan Dinevski* discuss in their paper *User-Centred Design for Elderly Patients with Low Digital Literacy* a user-centered design approach to e-Health services for elderly people. They propose a modification of conventional UCD methods to the needs of people with only low or none experiences with ICT which helps researchers in carrying out user studies.

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- <http://www.ami-communities.eu/>
- <http://www.openlivinglabs.eu/>

Online Lifebooks: Narrations of lived lives to foster inter-generation exchange

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Although age and aging are natural conditions related to biological processes, their meanings are socially and culturally constructed. Almost universally, aging is seen as an irreversible process that is likely to include infirmity, dependence, incapability and increasing levels of disability and dementia. In the light of this ominous perspective, birth rates and expenditure trends in healthcare are brandished to motivate investments and fundings on innovative technologies that sustain the imagined needs of an aged population (Charness & Boot, 2009). Correspondingly, contemporary mainstream ICT research is devoted to the design and experimentation of technologies that, much as they are seen as flexible, tailorable and unobtrusive, are but assistive means; or means to convey new goods/services for the elderly market segment as well as to adapt for it those services that are continuously conceived for the 30-65 year-old segment.

No matter how this could seem an unacceptable simplification, designing for the elderly is usually declined according to the dominant image where “aging persons” are somehow different from generic “persons that age” (as everyone does). The common place view of “elderly” as person that needs some structured assistance brings us to envision a technology that could help “aging users” get rid of consolidated images of the ‘aging’ and related needs, by enabling them to create their own image of their aging process, contrasting the socially imposed stereotypes

In this paper, we will outline the concept of such a technology and discuss its main requirements in the light of the relevant literature. We refer to this type of application as a Lifebook, so as to hint at its main functions, irrespectively of how they are actually realized. Indeed, we envision a Lifebook as an application aimed

at promoting the creation, sharing and co-construction of life-centered narratives: our point here is that *experience* and not *presumed* incompetence, should be the factor to take into greater consideration when designing for the elderly user; and how to valorize it should be the main goal to achieve, since experience is the resource that makes this category of users really different and homogenous with respect to the others, especially if considering their potential for content production.

To our aims, the concept of narrative is detached from any narratological technicality and it is rather closer to the meaning that the term has recently acquired in psychology and the field of human and cultural studies. In these ambits, narratives are conceived of as ways in which humans make sense of the world and in which a culture structures and propagates situated and experiential knowledge. Therefore, we intend narrative as "a mode of knowledge" or a "cognitive scheme" by which we understand the world and assimilate the intentional behavior of the others (Bruner, 1991); and we see them as "intricately related to knowing [and as] our way of taking the flow of experience and making it intelligible" (Baur 1994, p. xx), (Kreiswirth, 2000, 304).

The often-cited definition by Barbara Herrnstein Smith (narratives occur when "someone tells someone else that something happened") (1981, p.228) clarifies the main traits of narratives we also are interested in: these are accounts of situated events, governed by a processual nature and a double temporality, which is constituted by the chronology of the events (i.e., story or *fabula*) and their presentation in the text (i.e., discourse or *sjuzet*) (Rimmon-Kenan, 2006); they require an act of intentional and *verbal* sharing of sequential, up close, and personal facts that is deeply affected by a context of relationship and by even tacit conventions of expression; and, last but not least, they involve both a teller and a listener – or a writer and a reader - which are bound by a communion of some sort and by an interpretative and, possibly, empathic relationship where meaning is constructed and apprehended collaboratively (Iser, 1978). This bidirectional relationship is essential to the concept of narrative on which we focus for the design of a narrative-based technology empowering its users and the communication between them. To account for this twofold relationship, scholars have defined two intertwined concepts: that of *narrative intelligence*, i.e., the human ability to organize experience into narrative form (Bruner, 1986); and *narrative knowledge*, i.e., the human competence to understand the meaning and significance of stories through cognitive, symbolic and affective means (Polinghorne, 1988) and to respond to them adequately. These are both capabilities that we apprehend effortlessly since we are children: if narrative frameworks are an important part of the way we learn to approach the world (Nelson, 1989), also as adults "we continue to surround ourselves with stories, furnishing our worlds not just with data but with meaning" (Mateas & Sengers, 2003, p.1).

Several systems have been proposed with the aim to help people organize their memories and externalize their life, e.g., Memories for Life (Fitzgibbon & Reiter, 2002) and MyLifeBits (Gemmell et al., 2005). These projects are all based on the concept of “product for memory”, i.e., something to remember (as search and retrieve), like a picture, a recipe, a note, a web page, an email. Yet, in order to enable what Van Dijck appropriately calls the “googlization of memory” (Van Dijck, 2005), these technologies seem to adopt a naïve conceptualization of memories as *objective* facts rather than recognizing them in the act of remembering itself, in the discursive representation (and re-invention) of stories that relate to both private facts and to the reflections and interpretations of the others. Other systems are designed to support people in telling stories to one another (e.g., Umaschi & Cassell 1997; Ryokai & Cassell 1999), but they have focused on the creative dimension of inventing, and representing, fictional stories, rather than on the mediating role of personal, confidential and truthful narratives. On the other hand, Web 2.0 services and platforms seem more to promote decontextualized chattering and fragmentation of personal stories in thousands of incoherent trickles and snippets e.g., in Facebook postings, Twitter feeds, Google Buzzes (Carr, 2010, p. 91) rather than contribute in making sense of these personal facts all together. The induced sense of time has no substantial ties with the past, which is thus doomed to the oblivion notwithstanding its seemingly everlasting digital retrievability (Carr, 2010, p.193).

Several online services are devoted to support the narrativation of life stories. For instance, StoryCorps¹ is an (American) oral history project by a nonprofit organization that archived more than 30,000 audio/video interviews from more than 60,000 participants. From our perspective, the interesting point of this project is the face-to-face 'interview session', while the site with its services acts more as showcase and promotion initiative than as enabler of an interactive community to maintain around the collected stories. The Remembering Site (TRS)² is a similar initiative launched in 2004 that is aimed at facilitating the textual narrativation of life stories. All in all, both of these web-based initiatives provide little or no support to the dimensions of sociality and community life.

These dimensions are in fact the focus of interest of two recent online initiatives, which recall many features of other successful social network platforms (like Myspace and Facebook): Famento by Famento Inc.³ and “Story of My Life” by Eravita Inc.⁴. Famento, in particular, recalls Facebook from the logotype itself and seems to specifically address the older targets in that it also allows to create accounts for other persons “in absentia” (suggesting this could be

¹ <http://storycorps.org/> - The conversation of a lifetime.

² <http://www.therecoveringsite.org/>

³ <http://www.famento.com/> - “Your family History”.

⁴ <http://www.storyofmylife.com/> - “Keep your story forever”.

the case of either elderly people with very low e-literacy or passed-away persons to commemorate). “Story of My Life” looks more successful in its aim of gathering life-related narratives from its members. Preservation, i.e., the capability to store stories and make them accessible allegedly forever with commenting functionalities, is one of the main tenets of this initiative.

Yet, a Lifebook is radically different from these initiatives. In fact, these projects - as many others in this vein - simply undervalue the importance of narratives and sociality and how these complement each other in the co-construction of sense (e.g., through mutual annotation), the two aspects that we identify as the most important ones for our application of interest.

1 Envisioning a technology for life-related narratives

Inspired by the research and activity undertaken about narratives in fields such as psychology (e.g., Lynne & McLeod 2004), medical anthropology (e.g., Vibeke, 1997), medicine (Charon, 2006) and gerontology (Randall, 1999; Kenyon et al. 2001), and surprised not to have found so far duly exploited the potential of ICT in mediating narrative-based relationships between actors, we came to envision and design a web-based service we refer to as Lifebook. This is a digital “book” in which users can narrate true stories and their personal memories, as well as where “other” users can make sense of these accounts and strengthen their mutual acquaintance with the “teller” as a consequence of an active and participatory interaction between these. We discussed this vision in an informal and preliminary workshop and elicited the indications that we report in what follows.

Such a technology is aimed at fostering a narrative-based interaction between human actors (irrespectively of their age) by allowing tellers and their active “followers” to co-construct their narratives, in a fluid exchange of ideas, descriptions, tentative interpretations, inquiries and clarifications, by means of functionalities now widely adopted and stable like seamless message threading, asynchronous communication, instant messaging, content annotation and collaborative editing. In other words, we focus on technologies conceived to help “tell stories”, and “share narratives *that evoke* memories” which, for their own nature, are continuously mutable as they are built, comprehended, interpreted and even re-formulated, especially if they can be of some value for elderly people.

Moreover, facilitating elderly people to tell and share their memories can: provide young relatives with a sense of strengthened closeness and family belonging (because it gives them a “sense of the origins” and “continuities with their roots”); foster the transmission of values through generations (Parada & Viladàs, 2010) and the reappraisal of the importance of keeping in touch with the aged; these, in turn, could corroborate their image as *information resources*

(Powers et al., 1989), if not a downright cultural and educational resource that is rooted in a direct experience of past events.

To achieve these goals a narrative-promoting technology should support the easy *shareability* of the stories among people who are encouraged to “put in common” with others pieces of their experiential arabesque. Then stories can be spurred by an explicit request (mediated by the system) of (authorized) acquaintances (like when a grandson asks his grandfather “please grandpa tell me when you were in London under the Nazi bombardment...”) or undertaken by the teller’s initiative. The technology could then ask a couple of simple data to help frame the memory (like, if known, time, place, people involved in the narration) and then leave room for the textual reminiscence. During the composition of the story, the technology should provide wizard-like or one-click procedures for the in-line attachment of multimedia objects (like pictures, videos, audio excerpts) so as to facilitate the task of embedding additional elements, and the capability to keep stories in draft mode, i.e., provisional until the teller decides it is ready for shareability. At the completion of the story, the system could then ask who has right to see the narration from the teller’s contacts and whether these can forward the invitation to get access to the story as well. The publication of and access to the stories are easily encompassed within the standard functionalities of social network platforms but, right for this reason, a proper compromise must be met according to the e-literacy of the teller not to overload her with irrelevant requests and make publishing a story a pain. Moreover the technology should give both to the writer and the reader the capability to annotate and comment in a public and private fashion the story for private uses and to relate it to other stories (either of the same person or of others whose stories are accessible) as well as to events of public interest available on the Web (Cabitza & Simone, 2010).

Our research agenda is being articulated in a twofold path: on the one hand, we will analyze how existing online services are frequented and used by elderly people and how the social networks (like Activagers¹ and Intrage²) intended for the so called “silver surfers” (Bitterman & Shalev, 2004), are used by their members to collect personal experiences and memories and share them in some narrative form. In doing so, we aim to gain insight into recurring patterns of storytelling and social interaction “around” their stories, as well as to extract useful requirements on how to improve the inclusion and participation of aging persons in these initiatives. On the other hand, we are currently developing a prototypical Lifebook that integrates existing open-source tools (like Android³ as

¹ <http://www.activagers.com>

² <http://www.intrage.it/>

³ See <http://www.android.com/>

operating system for handheld multi-touch tablets, Drupal¹ for the blogging platform and the SIMILE timeline developed within the SIMILE project²) to undertake a focus group and pilot study with selected users and, hence, extract more precise requirements on which advanced functionalities could facilitate the creation and sharing of life-related narratives.

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¹ See <http://drupal.org/>.

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Motivating (Non-)Normative Freedom and Technologically Mediated Well-Being

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The elderly might become trapped in their own freedom. When Schwartz & Ward (2004) write that currently „freedom and autonomy are valued above all else and (...) expanded opportunities for self-determination are regarded as a sign of the psychological well-being“ they point to an issue that deserves attention, also and maybe especially in the development of new technologies.

Technologies are and always have been part of the human condition. Thus, freedom cannot be thought as defined by being free from technologies; and well-being must always be seen as being technologically mediated. We have always been cyborgs. Humans find themselves thrown into the world and part of this world is constituted by technologies. The goal must be to reflectively and critically accompany technological development in order to take an active stance towards the inevitable changes new technologies will bring about.

Inevitability, however, cannot produce a source for direction. Technological development cannot be condemned as a whole and should not be uncritically praised. The ways in which technologies mediate our perceptions and actions can be analysed and should consequently be subjected to normative evaluation.

Freedom is thus a highly normative notion and at the same time void of any direction.

The demographic change in the European Union has led to a lot of funding for the development of Ambient Assistant Living (AAL) technologies and when looking at the European scientific landscape one finds that the attitude described

by Schwartz & Ward is also represented in AAL research. In titles and goals of the funded projects, there are three notions that can regularly be found (BMBF 2011, iso e.V. 2011), which I will summarize under the umbrella terms: **health**, **freedom**, and **well-being**. The three goals are usually described as being intertwined.

Health is already a difficult notion. What is considered good health is strongly dependant on the environment one is situated in. It follows that assisting technologies will change what we consider a healthy life to be and where we see the line towards illness to be crossed. This change clearly has implications for social interaction on a very basal, non-institutionalised level. Yet, one can expect - and to a certain degree already find - these changes to manifest themselves institutionally, thereby shifting the focus away from the (inter-)personal and making them very tangibly relevant questions of society and democracy.

The focus here, however, will be placed on the relation between freedom and well-being. While the different formulations of freedom (autonomy, self-determination, etc.) as well as different formulations of well-being (e.g. quality of life), need to be examined closely in philosophy and denote very distinguishable concepts, they seem to refer to the same basic idea within the scientific community that is dedicated to developing AAL technologies. The aim of my research is to show that the intertwinement of freedom and well-being, which is presented as being mutually stimulating, cannot be left unexamined and should undergo philosophical and empirical scrutiny.

This immediately raises the question about what conception of freedom can be sustained in a technologically mediated world. How then can and should developers of AAL technologies deal with this freedom? And how will this affect the well-being of users?

The research of Schwartz & Ward (2004) provides insights that are apparently counter- intuitive to what most researchers in the AAL field believe to be true and also presents a basis for how to deal with it. To oversimplify: empirical research has shown that more choice leads to less well-being. Alongside a more detailed analysis and suggestions to counteract, the authors raise some issues that are of particular relevance to the field of AAL technologies.

The first concerns the number of choices. Schwartz & Ward suggest that the more choices one has, the more opportunities there are to decide sub-optimally. This effect is amplified, considering that a higher number of choices requires more cognitive work in order to arrive at a higher number of decisions. In a research area such as AAL technologies, where a significant number of users suffer various degrees of mild cognitive impairment, this issue is of enormous practical relevance.

The second issue that is particularly relevant can be found in what increases well-being, rather than in what decreases it (such as, apparently, too much choice). What increases well-being is sometimes even decreasing the amount of choice:

What assessments of well-being suggest is that the most important factor in providing happiness is close social relations. People who are married, who have good friends, and who are close to their families are happier than those who are not. In the context of a discussion of choice and autonomy, it is important to note that, in many ways, social ties actually decrease freedom, choice, and autonomy. Marriage, for example, is a commitment to a particular other person that curtails freedom of choice of sexual, and even emotional partners. To be someone's friend is to undertake weighty responsibilities and obligations that at times may limit your own freedom. Counterintuitive as it may appear, what seems to contribute most to happiness binds people rather than liberating them (Schwartz & Ward 2004).

This is of special practical relevance as many of the AAL technologies provide a context in which more choice is made possible at the expense of institutionalized social contacts. The possibility to live self-dependant in one's own home with less professional care for a longer time can lead to isolation.

The theoretical contemplation about freedom and empirical findings regarding psychological well-being come with practical consequences for the future development of technologies. Freedom and well-being come about in relation with technologies and not in their absence. This has rather harsh consequences for their developers. Since the technologies they develop will necessarily co-shape human freedom and well-being, they are by default morally burdened, as they cannot help but shape decisions and practices. It is for this reason that Verbeek (2011) refers to design as materializing morality. Thaler & Sunstein (2008) call people involved in this shaping *choice architects*. A choice architect is anyone who "has the responsibility for organizing the context in which people make decisions". In choice architecture there are so many potential influences, they write, that it seems a good heuristic to just assume that everything matters. This insight "can be both paralyzing and empowering". Paralyzed or not, designers cannot escape. How then should they deal with it?

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What's Up: Fostering Intergenerational Social Interactions

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Abstract. Among the many factors that affect wellbeing, social relationships are undoubtedly one of the most important ones. As we grow old, however, our ability to maintain and nurture them is challenged by a wide range of age-related changes that hinder our perceptual, cognitive and psychomotor capabilities. In this paper, we present a mobile communication platform specifically designed to foster social interactions between elderly users and their friends and family. To validate our solution and gain further understanding of the needs of elderly from a design perspective, a “think aloud” study was conducted, investigating the usability and applicability of our solution. This study and its results are described in this paper, showing how a simple, almost featureless, interface is suitable for the oldest group of users and informing our design about different interaction issues to take into account for the future development of our platform.

1 Introduction

It is a fact of life that as we grow old, our capabilities are reduced in numerous ways including, among others, the decline of vision, hearing and of psychomotor abilities (Drolet et. al. 2010, Fozard & Salant 2001). Because of these changes, elders' interactions with relatives and friends tend to be reduced, often restricted to sporadic phone calls and face to face meeting that are usually initiated by the elders. Most grandparents talk to their grandchildren less than once a fortnight, phone-calls seldom last more than five minutes and grandparents (or parents) initiate the great majority of the calls (Evjemo 2004).

Information and communication technologies can help to tackle this problem by considering better both elderly especial capabilities and youngsters modes of communication. Following this overall requirement, we have developed a communication platform that fosters intergenerational communication through the means of a mobile application with different views and complexity levels.

To validate our approach and gain knowledge to further improve it, we have given a prototype version of our solution to a group of 28 elders and asked them to “think aloud” while they were using it. The experience gave us invaluable information about the difficulties of using current mobile technologies and touch interfaces for the older adults, besides the fact of helping us to improve our overall platform. In the following sections, we briefly explore related work and introduce our solution, we describe the methods we have used for our preliminary study, and finally discuss the results and future work.

2 Related Work

Among the many technologies that address the issue of intergenerational social interactions we can find the PACE Project¹ and their experience with tele-mentoring using videoconferences between older adults and youngsters (Bernard et. al. 2011). StoryVisit.org is another application aimed to connect families (Raffle et. al. 2011), particularly children with their parents living far away by providing a web interface for video conferencing and synchronized story telling. Also inline, but aiming more at the overall social connectedness without stressing the intergenerational aspect we can mention Bettie², a touch device to send and receive messages, similar to our solution and to setup at home. Epigraph is another available tool that provides a screen divided into a number of channels, each representing each family member. Channels can be updated via email, text or picture message (Lindley et. al. 2009). In the same line, Meza-Kubo introduces a TableTop device that provides social networking features for family members and caregivers to connect, motivate, and monitor elders' activities (Meza-Kubo et. al. 2009).

Another related line of work is that of simplified interfaces for elderly users. Eldy³ is a system that simplifies the user interface of a PC, providing quick access to the most important functions. InTouchLink⁴ is another example of the same type, aimed at senior living communities, providing simplified access to email, internet, photos, calendar, news, among other things.

¹ <http://www.pace2000.org/>

² <http://www.bett.ie/>

³ <http://www.eldy.eu/>

⁴ <http://www.intouchlink.com/>

3 What's Up Intergenerational Communication

What's Up is a mobile communication platform developed within the Lifeparticipation project¹ of the University of Trento, with the goal of supporting intergenerational social interactions. It is composed of two main mobile applications that provide simple communication through a common infrastructure. At one side, the younger use *What's Up LifeShare*, a full featured messaging application developed for the most common communication device of youngsters: smartphones (both iPhone² and Android³). On the other side, elders use the *What's Up Display*, and iPad oriented application that works as a display of all received messages and pictures. Figure 1 shows the communication model we propose.



Fig. 1. What's Up's one way communication

In the first iteration, *What's Up Display* worked only in a photo-frame mode, receiving text and pictures⁴. Later on, three more levels of complexity were added, as shown in Figure 2, to enable simple two-way communication allowing the elder to ask for news (level 1, “What’s UP”), reply with like/unlike messages (level 2, “Feedback”) and reply with a text message (level 3, “Complete”).

¹ <http://www.lifeparticipation.org/>

² <http://itunes.apple.com/it/app/lifeshare/id466402571?mt=8>

³ <https://play.google.com/store/apps/details?id=it.trento.casagranda.simone.ysharee>

⁴ Demonstration/promotion video available: <http://www.youtube.com/watch?v=U-B-gfgjuz0>



Fig. 2. What's Up Interfaces for the Think Aloud Study

A prototype with all these levels of complexity was implemented for the study we describe in the following section, with the goal of understanding how much of the usability of the application is affected by the increasing complexity.

4 Prototype Evaluation: Think Aloud Study

In order to assess the usability and applicability of our solution, we have introduced the iPad to 28 elder users and then installed our application with a complexity level different from the last testing (to ensure heterogeneous opinions on different levels). Basic functionalities were explained to users, asking them to navigate between resources and explain what they felt, their thoughts and concerns. Usability and applicability were then evaluated using the following means:

- Each participant answered a questionnaire about the ease of use and comfort after using the first complexity level.
- Continuing the test, each participant tested the remaining levels of complexity.
- Each participant was then asked to produce a ranking of UIs by the level of enjoyment in using each of them.

Through all the session, each participant was video recorded while interacting with the application (“think aloud” method), with the goals of eliciting the way each UI is perceived and extracting mental models of the users while solving problems (Lewis and Rieman 1994). For the first evaluation, the formal mental model extraction was left for future work, doing only and empirical evaluation.

Of the 28 users, 16 belong to a young-old group (aging 65 to 74), 6 to a middle-old group (aging 75 to 84), and 6 to the old-old group (aging 85 or more)¹.

¹ The groups segmentation follows that of Drolet, Schwartz and Yoon (Drolet et. al. 2010)

5 Results

Most users responded positively when asked about the ease of use and comfort of the application, as seen in Figure 3.

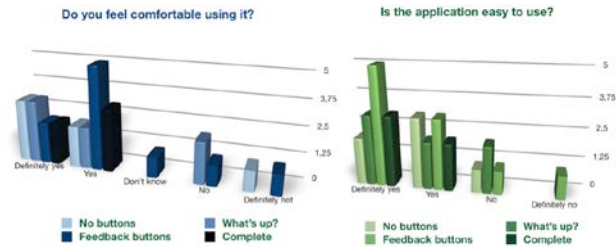


Fig. 3. Ease of use and comfort of the application.

Moreover, following other answers to the questionnaires, overall evaluation of the design is positive. Buttons meaning was clear and readability was 100% positive. Almost all feedback about aesthetics was positive.

When asked 'would you use the application?' most elders that would not use the application are those that do not use computers either, while others are more in touch with technology. Furthermore, most elders answered that they would use the application alone (provided that they have been taught how to turned on/off the iPad). On the frequency of communication between elders and youngsters, our results show that people that are not willing to use the application are in general less willing to communicate also with other technologies.

The final question on the questionnaires was about the preferred interface level. Figure 4 shows that young-old elders prefer the most complex application, while the old-old users are more willing to use a simple interface, with no buttons and where they just have to use the finger to navigate the resources. When not considering age groups, however, no interface was particularly preferred, which means that applications should be customizable in this aspect.

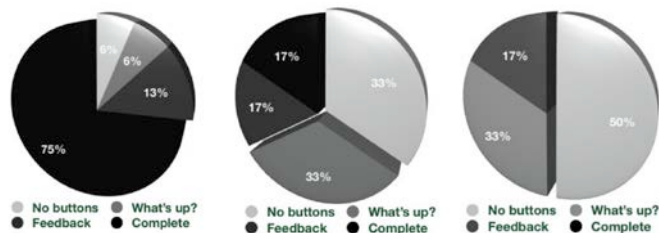


Fig. 4. Preference of interface levels by age group in ascending order.

Finally, from the empirical evaluation of the think aloud videos, the most important results are as follow:

- For the simple, no buttons interface, most users did not have problems, even with shaking hands.
- The ‘unlike’ button might not have a clear meaning in occasions.
- Shaking hands is a problem when using a keyboard or buttons making them involuntary press the device, which later disorientates the elders for the unexpected application behaviour.
- Sometimes, users were touching button images in the wrong place, indicating some difficulties for understanding icons.
- Some users tried to scroll buttons, indicating that multiple interaction patterns can be confusing for some elders
- Faster users pressed buttons over and over again during delays.

A summarized video of the think aloud protocols is available online with further conclusions of our analysis¹.

6 Conclusions and Future Work

In this paper, we have introduced a communication platform that enables intergenerational social interactions through the means of mobile applications that run on smartphones for youngsters and on tablet devices for older adults.

With a first prototype of our platform, we have collected think aloud protocols and answers to a questionnaire about its usability and applicability, preliminary demonstrating that a platform of this type has a real potential for filling the communication gap between elders and their younger social connections.

Our results showed that the number of provided features changes the levels of experienced usability and applicability in the elders. Adaptability of complexity seems to be an important design requirement given that no interface is the most preferred by all age groups. For the oldest users (aged 85 or more), however, the most simple seems to be clearly preferred. The applications initially should be presented to the elders with the most simple interface and limited classes of features, adding a new class of features only after the user gets confident.

We have also collected important information about the use of this technology and the willingness of older adults to use it for communication, which can be very useful for application designers working for this type of users.

Future work include the formal evaluation of the think aloud protocols to extract mental models, running an usage study to understand the when and why youngsters would share a message with the elders, and the overall improvement of

¹ Think aloud videos summary: <http://www.youtube.com/watch?v=pouFfeR0n0A>

the application capabilities including the support for sharing videos, synchronized viewing of resources, cleaned UI design, among other things.

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Motivating Elderly People to Use Fall Preventive Exercise Training Games at Home: Are Community Based ICT Features Always a Good Choice?

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Abstract. In this paper we present first insights of designing community oriented exergames for elderlies to motivate them to use fall preventive exercise training at home over a longer period of time. Informed by current research on persuasive design and gamification, we build mock-ups that illustrate our design idea of that elders might be interested in online communities while playing. Discussing the mock-up and the underlying assumptions with elderly people in a participatory design workshop, however, showed that they have another perspective on this topic. For them, the design should focus on the necessary features to exercise fall preventive training in the most effective and efficient way instead of looking on nice-to-have community features. In this workshop, we want to discuss, how to deal with this different perspectives in participatory design and if and how community approaches could support motivation of older people to play fall preventive exergames?

1 Introduction

In new areas for computer technologies applied for independent living of older adults at home, like Health, Energy conservation, or keep to a diet, motivating users becomes a central issue addressed by approaches like persuasive design

(Fogg 2002) or gamification (Danforth 2011). Similar ideas have been used to motivate elderlies to taking part in sport or physical education (Drew und Waters 1986; Ijsselsteijn u. a. 2007; Gerling, Schild, und Masuch 2010). In the domain of fall prevention such exergames are useful to improve muscle strength and balance to gain a better protection against falls (Gillespie 2009). And thus, fall preventive exergames tailored to the abilities and the life situation of community-dwelling older adults are a good opportunity to provide effective fall prevention at home. Furthermore, modern exergames allow to take part in collaborative physical activities and education over a distance (Wulf u. a. 2004; Mueller u. a. 2007).

In the EU FP7 research project iStopFalls we focus on motivational issues of older adults playing a fall preventive exergame at home. The aim of iStopFalls is to develop and implement ICT-based technology preventing and protecting against falls by means of a long lasting exercise training program (Exergame). Thus, we want to address the question of motivating older people to use such an exergame with the help of integrating community-based solutions like collaborative activities and gaming.

In this project we followed a participatory design approach including elderly in the design process just from the beginning. Hence we started with 6 semi-structured interviews with elderly people in Germany. In these interviews we focused on the peoples' fall experiences, their media consumption habits and motivational factors as community-based approaches and others. All interviews were analysed with the help of Mayring's content analysis (Mayring 2007) to group the data into categories.

In a second step, we invited five elderlies to join a user-workshop which was split in two sessions. Session A focusing on the user experience playing exercise games using MS Kinect for 45 minutes and was followed by a group discussion of about 15 minutes. Session B was a Participatory-Design workshop, where we present our design ideas about community oriented exergames by mockups of a possible main menu of the iTV application to be developed, and by means of the card sorting method. The menu points included: (1) *Game* (start game here), (2) *My Profile* (to view one's data), (3) *Friends* (what are my friends doing?), (4) *Learn* (pointers for healthy living).

2 Results

Contrasting to the assumptions about improving exergames by integrating online communities while playing, we get to know in the interviews another perspective of the elderly users. Most of the questioned seniors stated that they don't need additional computer support to get socially connected. They visit public facilities, such as Internet cafes or senior centres, at least once a week, to interact with other seniors. Thus, they participated regularly in different group activities or met up with friends to go hiking. They emphasized that they prefer these kinds of direct

personal contact instead of connecting with people in virtual worlds. This coincides with the statements of the workshop participants regarding the menu item *Friends*, that most participants thought unnecessary. The majority of the users do not want an integration of social networks into the iTV/Exergame application.

The seniors all said to be in close contact with their families and in this context they could imagine an integration of a social component as possible. Many participants, both from the interviews and from the workshops, said, that they would like to be able to play with their grandchildren in order to share a common interest with them. In general, most participants imagined playing together with well-known people, as them all being in the same room together and not as playing together via a network in a virtual world. One older participant however said that she would like to keep in touch with other people, but did not like traveling that much anymore. Under this aspect, the integration of a social network would be an advantage for her. A precise suggestion for the integration of social contacts is not possible at this stage. As mentioned above, this topic might still need to be further analysed and discussed.

Additionally the users had a very pragmatic way of using new media. In general, the participants expressed a desire for a simpler and less ambiguous menu. The participants agreed further that they wanted a menu without lots of accessories and other extras, but one that was simple and easy to get to know and use. „You just want to play and see what you’ve accomplished. Why is it necessary to have *Friends* and *Learn* in there?“ one participant clearly said. Another added: „The exercises are what’s important.“

In summary the participants preferred to play with family members at home and not in a virtual community with unknown people as we thought right at the beginning. But this perception may be due to changes, if we would have done our interviews and workshops with more lonely and isolated older people instead of the more active and well socialized participants of our workshops and interviews.

3 Conclusion and future prospects

This first results show motivating elderly people is much different from a community-based networking approach which seems to target the younger facebook generation. This indicates that motivational design for elderly has to be different to motivational design for youngsters which in accordance with the general finding that design for elders have to be different (Lindley, Harper, und Sellen 2008). While the integration of community features in ICT is today totally normal for younger people, older adults do not necessarily want these features. Instead of virtual worlds, elderlies wish to play concerted in their own living room.

Finally, the question leaves open how to cope with these divergences: Maybe another approach will be needed to enable older adults to engage themselves in health-relevant activities at home. Furthermore, it would be interesting to think about intergenerational approaches to foster interaction between young and old people. For example we can think here of games between older and younger neighbours, their (grand-)children or friends. Nevertheless, we want to discuss additional possibilities to bring such scenarios into action as motivational factors for elderly people playing exergames.

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Social Interaction through Participatory Design in a Residential Care Home

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Abstract. This paper describes a user-centered design process in a residential care home. We explored how to provide residents with meaningful and pleasurable internet applications via a large screen display. The paper focuses on the technological and the social development of the field in a long term view. During the development we learned a lot about the possibilities we can give elderlies, professional caregivers and relatives with new technologies.

1 Introduction

In this paper we wish to report about the participative and user centered design works in a residential care home. Over a period of more than three years we conducted several projects now, which altogether have the aim to develop a spectrum of infrastructure and content which serve as a meaningful and joyful contribution to the every-day live of the residents. For doing so, we accomplished a broad qualitative pre-study based on interviews and action-research based activities in the house to foster a mutual learning process: for the residents to get a feeling for media and internet applications and for the research team to develop an understanding of possible topics which could be of interest and of joy for the residents. A description of the pre-study under a methodological focus is given elsewhere (Müller et al. 2012). In this paper we wish to provide detailed information on our work with the different stakeholders which is fully embedded

in an empirically-based design approach (cf. Randall et al. 2007). This paper focuses on the related social interaction between different groups of stakeholders related to the project. The technical development and the public display system itself, which we installed during the research activities is not focused in this paper.

The development of ICT for elderly has special hindrances to deal with, see e.g. for a discussion (Coleman et al. 2010). The project's target group contains partly very old residents of a care home (80+) who have not had any contact with the internet or computers before. In addition, there arise some problems with common user-centered design methods due to the large knowledge and experience gap between researchers and the target group. This "symmetry of ignorance" (Fischer 1999) between researchers is caused by some grave factors: on the one hand, the prospective target group is often not aware of ICT to be a meaningful contribution to their every-day life; they have no related experiences and knowledge and thus, do not consider ICT as an option for them. This often leads to a full rejection of even thinking about the topic (based on different reasons, e.g. identity construction, fear of being seen as "stupid", etc.). This starting point needs to be taken up very carefully in a design project, which is, at first to start with methods which help to open up the willingness to get involved in the topic and a suchlike project. With other words: "empowerment" is not a self-evident goal, when people do not see a meaningful reason to "be empowered".

On the other end of the "symmetry of ignorance" there are researchers who do not know much about the interests of the residents which could be meaningfully addressed and supported by ICT. Thus, there are questions such as which programs could be offered on a large-screen display which serve as a contribution to their conduct of every-day life, their joy and happiness.

Besides the elderly and the researchers we have to deal with the professional caregivers and the management of the old people's home as third party with interests, knowledge and own aims and attitudes towards technology use in the facility. Furthermore we noticed that even the caregiving personnel in the old people's homes often isn't aware of the possibilities current technology offers for their daily work with the elderly. Here we can find a second level of symmetry of ignorance.

2 Pre-study

Our set of methods constantly evolved since project start, beginning with an interview series on-site with 15 persons (residents and staff), and participant observation over several days. This pre-study provided us with valuable insights. However, motivational issues, e.g. how to interest and motivate residents for the project so that they see themselves as contributing participants, needed some more interactive and participative methods which better supported mutual learning between residents, staff and researchers (cf. Blythe et al. 2010, Frost and Durrant

2002, Gaver et al. 1999). That's why in the next step we applied some more explorative and participatory methods. In doing so, we organized two days on different weekends (the 'internet days') full of activities and offers to get to know about internet applications.

Together with student volunteers we set up an internet connection, brought laptops and large monitors to the home and developed a concept on what to show the residents and how to best involve and interest them. The students started then to show for which activities they use the internet and then – step by step – a common exploratory journey started between a student and a resident in front of the computer (see Müller et al. 2012 for a detailed description of the methodological challenges in the project).

The results of the 'internet days' were manifold: by bringing the technology to the house we could trigger the residents' interest and motivation to start dealing with new media as a possible option. In other words, a common space for further collaboration and reflection had been opened by the 'internet day' activities. In addition, we could derive some 'anchor points', i.e. topics, which are of value for the residents and which have the potential to lead our further conception and development work. These 'anchor points' were the interest in photos from events and trips organized by the management and the employees of the house, the interest in news from areas near to the house and the interest in information about former living places of the residents. Altogether these points were not only of interest for the individual residents but were anchor points for social interaction, too.

On top of this development related insights we triggered a lot of social interaction between the elderly living in the old peoples home, the professional caregivers, the relatives of the elderly and people from the neighborhood of the care home.

During the 'internet day' activities, the residents noticed that there were many "foreign" cars parking near the house and many young people in the old people's home, as one lady pointed out in an interview. The internet days acted as a ticket to talk over a long period of time and besides of our lessons learned the caregivers started using the internet for their daily activities.

3 Workshops and regular presence of the team in the house

Based on the preliminary findings of the first interview phase we developed a first set of categories and contents of interesting information which could be digitally provided as mentioned above. After that we started conducting ongoing workshops beginning in 2009 until today which serve to deepen research and development questions or to try out technologies. Based on this long term

cooperation with the old people's home we had the possibility to strengthen the methodological approach and to verify the findings over a long term view.

For each workshop, the manager asked residents if they wish to participate. Thanks to this personal engagement we had always about five to fifteen participants in our workshops.

Altogether we accomplished more than fifteen workshops up to today with two main focuses. One focus of the workshops lays in the discussion of sketches, the tryout of prototypes or mock-ups developed during the project, the other focused on contents offered with the developed technologies.

In addition, the manager and the staff conducted biography work sessions, with individual residents and also with groups. In these sessions they collectively search for stations and entities of the residents' life, such as pictures and information of the home town, work place, etc. The material is then collected in a word document, printed out for the resident and stored in the system. A future research strand will be in the question of how to best represent this material and make it easily accessible to the residents via the social display. To follow this research direction, we accomplished workshops which aimed at developing an application on basis of google maps and to provide the people with an adequate input device for geo related content to use a map and to add narrations to a map and find them later. The actual prototype is based on paper maps – which are well known by the elderly – and a webcam which detects areas on the maps and opens the collected information about this place on the large screen display. This research here is still ongoing.

Another strand of workshops was directed to a music listening tool, the 'jukebox' prototype. We conducted group sessions in which music played the major role, such as listening music or doing exercises together with music, or only having music in the background during, e.g., a cooking group. Here, we could start a chat about favorite music groups and genres and derive categories from the view of the residents. We found that elderly have differing categories of music than we tend to have. Which plays an important role when offering music to the elderly because they feel misunderstood when we mix together different music styles from their point of view.

The genres of music interesting for the elderly were found in a three-step approach in the care home. In the first step we talked to inhabitants and employees about music flavors and took their favorite cd's and cassettes with us. In the second step we digitalized and pre-categorized the music along the findings from the first approach. Additionally we recorded songs from the favorite radio stations of the elderly. In the third step we organized a music workshop with the elderly in which we categorized the music together with the elderly.

Those categorization workshops served to better understand the ways how elderly categorize music and helped the personnel and us to find better mixes of

music interesting for the elderly. During the workshops many elderly noticed that they liked the same music and sang songs together.

Besides the interviews, activities and workshops, one or more members of our team are regularly in the house (at least once every two weeks), for informal chats with residents and staff and for observation of the display usage. We also have located some development sessions into the home, making the development activities of the display more transparent.

4 Adoption processes (sociality)

The research and design activities prompted social processes in the home in various directions. While the area in which the display is located had been a frequented area before (mainly because the manager's office is located there and residents often come for a chat on their stroll through the house) there was not much social interaction between the residents themselves, which some of them articulated as a problem in sociality in general.

To give another example there is a group of 'younger' elders who come every day for lunch to the house. They usually go directly to the dining hall and do not interact with the residents in the house. Since the display was mounted in the old people's home, they come earlier to engage with the display and stay there for a while after lunch.

Another phenomenon is that people love to search themselves in the pictures on the large display. By this, new prompts for chats and interaction are given. Furthermore it is used when relatives come for visits to show what the elderly have done during events, e.g. as the participation in organized excursions by the house.

On behalf of the staff various adoption processes have started, such as using the display for reminiscence sessions with individual residents or with groups. Interestingly, there were some women working in the social service who were not familiar with ICT before and accordingly could not imagine how this could help them in their work. Now, for them, the easy-to-use input device is a first step towards new media in their biography work with residents. Their first animosity against new media could be reduced by this. Additionally another employee of the social service who used the computer in his private life before, uses the social display to enrich the biographic work sessions with media. The elderly and the caregivers feel more comfortable to get in contact through the display.

The old people's home has a protected housing for the elderly in their neighborhood. The people living there often come to the old people's home for lunch and offered activities. Some of the 'younger' elderly lunch visitors, being a bit experienced with new media, take up the role of a 'display operator' or facilitator, respectively, for the residents who also now stay there for collaboratively browsing through the programs. This role developed since the

display was installed. The visitors from the protected housing learned the usage of the display very quickly and were helping the residents of the old people's home to get into the usage of the public display. Through this development we have triggered a new way of interaction between the residents and the guests from the protected housing.

Another example is how news is being spread when new content has been uploaded: This happens by word-of-mouth in the dining hall where people come three times a day and which is located near the display area. One effect is that the residents talk more to each other and then watch the new content together, especially when new photo albums have been uploaded.

We noticed that through the communication in the dining hall the residents inform each other when new photos or movies have been added to the public display. The amount of people being in the cafeteria, where the display is located, before or after the meals increases and there is more social interaction between the persons.

5 Ongoing requirements collection/ Feedback mechanisms

We put a post box, with a notice that the box is intended for feedback, and sheets of paper and pencils next to the public display. Our intention was that the users could write us notices, reporting problems or feature requests as we could not be in the old people's home regularly to interview users during the first month of usage. Until now the box was empty the whole time as the users disliked to write notes for several reasons. One reason was that they disliked writing problems down as they had problems to formulate correctly what they wanted us to tell. This is on the one hand caused by missing vocabulary of technical terms and on the other hand caused by the fact that the elderly had difficulties to locate and formulate what exactly is wrong.

When talking to the users in usage situations or even in interviews without parallel display usage, we found out, that we got really interesting feedback from the users which we could mostly bring into the next release of the display. When talking to the residents we could help the elderly in their articulation of their feature requests and as we knew about technological possibilities we could give them a bigger design space for their ideas ad hoc. Using this interactional methodological stance as trigger for new design input from the elderly and to lower the symmetry of ignorance, we still have to be aware of the fact that the personal contact and related feedback is most important for our development.

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ActiveLifestyle: an application to help elderly stay physically and socially active

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Abstract. Age typically brings motor control impairments and loss of the lower body muscle strength, which can lead to falls, injuries and, in the worst case, death. It is well known that the practice of simple daily physical exercises can reduce the likelihood of falls, however, it is also known that it is far from easy to motivate elderly to exercise, especially autonomously at home. To address this challenge, we have designed an app that not only makes it feasible and easier to follow a training plan for physical exercises, but that also introduces individual and social motivational instruments to increase the adherence to a plan – everything inside a virtual community composed of training partners, healthcare experts, and family members.

1 Introduction

The incidence of falls among older adults is high. Approximately 33% of the community-living elderly fall at least once a year in developed countries (Deandrea et al. 2010). This percentage increases to 50%-70% for elderly over 85 years old living in the same conditions (Iinattiniemi et al. 2009; Yeom et al. 2011). Falls can lead to injures, fractures, dependency to perform daily living activities, and, in the worst cases, to the elderly' premature death.

As an attempt to decrease these numbers and promote elderly's health, wellbeing, and independence, the Healthcare Community (i.e., physicians, gerontologists, and human movement scientists) strongly recommends a routine of physical exercises, more specifically strength and balance (Sherrington et al, 2008).

It is well known that being physically and mentally active implies many benefits to a person's health, while inactivity is at the origin of several chronic diseases (Katzmarzyk & Janssen 2004). However, people, and especially old age adults, typically don't know how to include even simple exercises in their routines, and they lack motivation. E.g., in Korea, even with strong support from the government and the healthcare system, only 9% of the elderly practice vigorous physical activity, 10% practice moderate, and 48% practice walking (Yeom et al. 2011). Hence, the sole availability of money and training plans is not enough and the need for further studies to discover how to motivate elderly to follow physical activities remains.

We introduce an IT-based solution for active and healthy ageing, named ActiveLifestyle app, that aims to improve elderly's balance and strength and specifically aims to keep them motivated. For that, we propose a pro-active software for physical training that assists and monitors elderly. The software comes with individual and social motivation features that aim to persuade elderly to keep a routine of training exercises. The software was specifically designed for elderly and runs on an iPad. The trainings and the design of the app were developed together with human movement scientists of the Institute of Human Movement Sciences and Sport at IBWS at ETH Zürich.

2 Example Scenario

As a fictitious scenario, let's take Albertina (80), a healthy and alone living woman that has been presenting some difficulties to stand up quickly and has fallen some times in the last year. In order to prolong her independence and avoid serious injuries, her doctor prescribes an 8 weeks plan of balance and strength exercises.

According to the plan, the strength workout sessions must be done twice a week, starting with 6 warming-up, followed by 9 strength, and finalized by 3 stretching exercises. For each, she has to do a minimum number of sets (1-3) and repetitions (10-15). In some exercises weights are required (2-6kgs). In practical terms, Albertina needs to know which exercises she has to do every day and how (i.e.,

sets, repetitions or seconds, as well as the amount of weights). As Albertina is not used with the exercises, she might have an easy way to learn/remember them^{1,2}. Albertina spends more than half an hour exercising the days she has to perform both sessions. Sometimes, following the rather repetitive, mechanical exercises is boring, and only her goal to remain independent is not always enough to maintain her motivation high. Supporting her to follow a plan of exercises autonomously at home therefore also means doing the work of a personal trainer and taking over planning of exercises, but also helping her track her progress and motivate her.

3 Requirements and Principles

The aforementioned barriers pushed us to extend our previous work (Daniel et al. 2011), developed to remotely assist and monitor runners during a marathon training plan, to support elderly's strength and balance training plans. For that, we need to:

- design an interactive and friendly UI to be easily understood and managed by elderly users with no or only few computer skills;
- offer support for balance and strength training plans, informing the user when, what, and how to do each exercise;
- collect, process, store and report information to allow healthcare experts to remotely monitor the users' performance and compliance with the plan, their mood, and also detect eventual problems;
- allow remote communication between elderly and healthcare experts;
- support motivation instruments to persuade elderly to follow a plan.

Motivation is a very broad, multifaceted and complex topic that has been researched for ages by psychologists and sociologists without reaching an agreement about the real factors that motivate someone. Though, it is common to find research where motivation instruments have been successfully applied. In the IT field, we can mention the well-known work lead by Fogg (captolgy.stanford.edu) to motivate people to follow a certain behavior. As a first attempt we decided to follow his intrinsic and extrinsic motivation strategies (Fogg 2008):

Intrinsic motivation strategies are based on triggering someone to do something because it is inherently enjoyable for this person, independently of any external pressure. For example, by means of:

- goal-setting: establishing specific, measurable, achievable, realistic and time-targeted goals;
- self-monitoring: allowing people to monitor themselves to modify their attitudes and behaviors to achieve a predefined goal or outcome;
- creating awareness: showing the benefits of following a determined behavior or the progress toward a plan;

¹ E.g. of balance exercise (Heel-to-toe walk) youtu.be/krxw-1mfrDc

² E.g. of strength exercise (Chair stand) youtu.be/RTXDWiCpSZQ

- conditioning through positive and negative reinforcement: immediately offering a reward/praise for someone after an expected behavior to encourage it and as a result increase the probability that it happens again, or the opposite, reprimanding whenever undesired behavior happened aiming to decrease the probability of a relapse.

Extrinsic motivation strategies are build on social psychology, in which other people can be the source of motivation. For example, by means of:

- competition: proposing a goal that can be shared and at least two parties strive to reach it;
- collaboration: offering a beneficial outcome that the involved parties can only achieve collaboratively;
- comparison: allowing a person to compare similarities and differences between two or more parties, people tend to keep equity in their relationships.

4 Architecture and Implementation

Figure 1 shows the architecture of the ActiveLifestyle platform, and its main components are described in the paragraphs below.

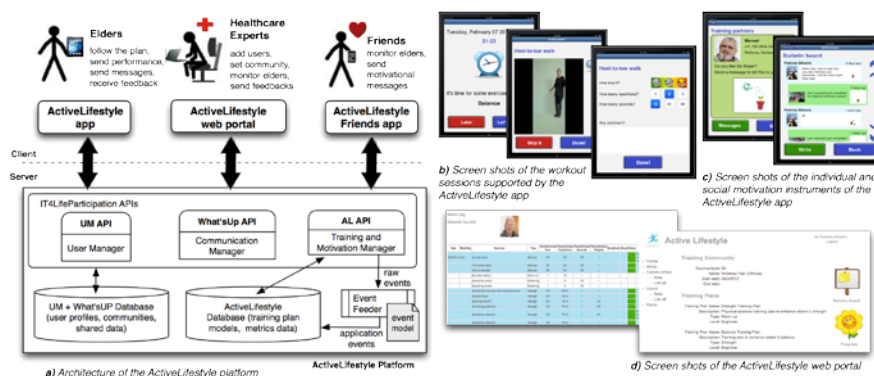


Fig. 1. a) Architecture of the ActiveLifestyle platform; b-c) Screen shots of the ActiveLifestyle app; and d) Screen shots of the ActiveLifestyle web portal.

The iPad *ActiveLifestyle app* is the core of the platform. It is responsible for the communication with the elder. The app supports the elder during the workout sessions (e.g., via videos and written details about the correct movements), collects their feedback (e.g., the number of performed sets, repetitions, and used weights, as well as mood and additional comments) to be further remotely monitored by the expert and used as input to compute metrics and set the motivation instruments. Using this app, the elder can also send/receive messages to/from his/her healthcare experts and friends. For more details watch our video available on the Web: youtu.be/Akvs13UMvfc and youtu.be/MT0UCQD5Odo.

The *ActiveLifestyle web portal* (test.lifeparticipation.org/ActiveLifestyleWebPortal) allows healthcare experts to

create training plans, associate them to users, manage communities, and remotely monitor the users' performance, as well as communicate to them whenever necessary to send motivational feedbacks.

Finally, the iPhone *ActiveLifestyle Friend app* allows the elder's friends to send and receive messages. In addition, the app can show the elder's performance, allowing the friends to monitor the elder and to provide feedback.

The applications and web portal invoke REST services and exchange JSON messages with the IT4LifeParticipation APIs. The UM API deals with authentication and user management issues. The What'sUp API controls the communication and social aspects (e.g., communities, messages exchange). Finally, the AL API manages the training plans, the motivation instruments, and the feedbacks of the users sessions. The event feeder consumes raw events (JSON messages) containing the details of the performed activities, parses them according to an event model, and transforms them into application events to be finally stored on the database.

The ActiveLifestyle platform makes part of the LifeParticipation project, which not only aims to help elderly to stay physically fit, but also to feel useful to society and be socially involved. More information about it and a complete state of the art is available on our website site at lifeparticipation.org.

5 Evaluation and Conclusion

To evaluate the ActiveLifestyle app, two tests are planned. At the moment we started the Feasibility Test, in which 15 Swiss elderly (76-84 year old) are using the app during two weeks^{1,2}. The test aims to evaluate the feasibility of the app and the iPad adoption by elderly. To collect the results and evaluate our hypothesis we adopted three questionnaires (i.e., health, technology familiarity, and feasibility). The test is ongoing, but we are already very satisfied with the preliminary results. Most of the participants have been doing the exercises and sending enthusiastic comments. For example: *"I feel fine thanks to your help; "I have age. I did the exercises more bad than good. Hope you all do it better", "The right leg is much stronger than the left leg! I feel that the training is necessary"; "I'm glad my legs are not always so hard!"*). Apart of that, the participants already asked how to continue the exercises after the study, and one of them already bought an own iPad. So far, our participants seem very enthusiast. If this paper gets accepted, we will be able to present the complete results of our study in the final version and during the presentation.

In the second round, Physical Test, 30 elderly adults will follow the physical plans for 12 weeks. At the first 6 weeks one sample will be supported by the app and the other not, and at the last 6 weeks we will switch this configuration to obtain a cross validated results. Apart from questionnaires, this second round includes a

¹ Teaser of the Feasibility Test: youtu.be/pgyYSjAR6h4

² Höfner Volksblatt newspaper note: <http://www.lifeparticipation.org/images/news.pdf>

physical evaluation before and after the plan to measure their fitness and improvements.

We are strongly confident about the possible physical and social improvements that can be achieved with the ActiveLifestyle app. In the near future, we will be working to add the missing motivation instruments and to fix the eventual issues raised during the on-going study to have a complete app for the second round of tests.

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User-Centred Design for Elderly Patients with Low Digital Literacy

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Abstract. As a result of being familiar with the benefits of e-Health, Telekom Slovenia and the Faculty of Medicine from the University of Maribor have worked together on an e-Health project. In order to achieve a high and effective user adoption of e-Health services, a user-centred design approach was employed in the project. This paper describes how well-known conventional UCD methods could be modified to support researchers in carrying out their user studies with people having a low digital literacy.

1 Introduction

In recent years, the number of Internet users worldwide has dramatically increased. People around the world are using the Internet for various purposes. Some of those purposes are also health-related. The term e-Health was first introduced in the late 1990s as a new term to describe the combined use of information and communication technologies (ICT), especially the Internet, in the health sector (Mitchell 1999). Various studies have concluded that e-Health is effective in terms of significant cost reduction for patients and the health system, increased health-service efficiency and user satisfaction, reduced travel times, and increased technical usability (Gartner 2009, European Commission, Stroetmann et al. 2009).

Being familiar with all the benefits of e-Health, Telekom Slovenia and the Faculty of Medicine from the University of Maribor and other partners are working on an e-Health project, which is shown in Figure 1. The project group is developing various e-Health services that are based on modern ICT solutions and will be available on several screens, such as: television, personal computer, smart-phone and tablet. Depending on the purpose of use, the specificity and utility, the e-Health services in the project can be roughly divided into three groups:

- Social-care services for easy and safe independent living at home for older adults;
- Services for the remote monitoring of patients with chronic diseases, for home-care or for general-practice care;
- Fully integrated hospital solutions, solutions for sheltered housing and senior living institutions.



Figure 1. e- Health project: the process of the fully integrated health-care delivery

One of the main dilemmas about e-Health and its adoption among users is associated with people that have a low digital literacy – elderly people in particular. They are often afraid or are not able to use new technology, such as personal computers, smart phones and other intelligent digital devices (Gregor et al. 2002 and Stojmenova et al. 2012). Most of the current systems, software in particular, are traditionally designed for younger people with a high digital literacy (Newell and Gregor 2002). As a result, such software can be either difficult or impossible to use by the elderly and other people with a low digital literacy. Various guidelines exist to support user-interface design for elderly

people. However, designers cannot rely only on guidelines, but need to involve the elderly users of the products and/or applications throughout the design process. Numerous user-centred design (UCD) methods and techniques are well known and widely used. Nevertheless, conventional UCD methods and techniques are not completely appropriate for a large diversity of elderly users. Part of this problem lies in the differing user characteristics, languages, cultures, environments and motivations among the vast number of users.

An important part of the e-Health project was to find out how age-related issues - such as, vision, hearing and cognition and other characteristics of the elderly people – such as, psychosocial skills, self-efficiency, communication, expectations, experiences, learning styles and preferences affect the conventional UCD methodologies. This paper describes how broadly known conventional UCD methods could be modified to support researchers for carrying out their user studies with elderly people with low digital literacy for e-health applications.

2 User-centred design methods

The term user-centred design (UCD) represents a design philosophy and a process in which the needs, wants, and limitations of an end user of a product or application are given extensive attention at each stage of the design process. One of the best known guides in implementing the UCD approach in practice is ISO 13407, which defines standards that support the design, development and evaluation of usable products (Bevan 2009b). The standard represents a general reference and describes five main activities for a software life cycle: plan the human centred process, specify the context of use, specify user and organizational requirements; and produce design solutions.

Taking into account described activities in ISO 13407, the criteria for selecting methods in UCD (Bevan 2009a) and the Usability planner tool (Ferre et al. 2010), for the purpose of the e-Health project, the following methods were considered:

- Wants and needs analysis. It is quick and inexpensive, brainstorming method for gathering data about users' wants and needs from multiple users simultaneously.
- Focus group. It is a group of six to ten people, who are brought together to discuss their experiences or opinions about a topic presented by the researcher.
- Card sorting. Involves writing objects that are in – or proposed to be, in the product or application on cards and asking users to sort cards into meaningful groups.
- Personal and group interviews. It is one of the most frequently used methods for gathering user requirements.
- Surveys (SUS and AttrakDiff).

3 User-centred design and elderly people

Elderly people represent a very diverse group. For appropriate UCD methods adaption it is necessary to firstly conduct a study on the characteristics of elderly people and to find some important common characteristics that make these people different from the other groups of people. User researchers have to analyse those characteristics and consider them in their user studies. In our previous work we used findings from such studies along with various guidelines to design health applications (Stojmenova et al. 2012, Pustišek et al. 2011, Guna et al. 2011). However, in this project, we have chosen a different approach. We will analyse the findings from the user study and look for the findings' impacts on the selected UCD methods.

4 Modifications for the elderly people

Even though gathering requirements from elderly people is vital for user adoption of a product or application, eliciting requirements from the elderly is considerably more difficult than it is from other groups of people (Eisma et al. 2004). For example, most of the elderly people have not used e-health services. When asking them questions about their wants, needs and expectations from the service they are not familiar with, they will not always know what they would really like. Additionally, when presenting them a single option for the service, they might have problems estimating whether they like the option or not. Another problem that might appear with elderly people is they can be reluctant to complain or criticise products. Elderly people often think that not liking a presented option might be understood as an inappropriate behaviour to the researcher.

In order to get valuable results for what our intended users want and need from the e-health services, we will present study participants some basic use-scenarios of several e-health services, so that they would get acquainted with them. We will clearly explain them that we will not be offended if they do not like the service or do not find it usable. Afterwards we will make some stories and ask users to play a certain role.

For example: Imagine you are cooking dinner in the kitchen. In the meantime, you hear the news started on TV, which is in the living-room. Since you do not want to miss any important news, you go to the living-room to turn the volume up. When you return to the kitchen you see a fire started. What will you do? What do you need?

Presenting the service in a real case scenario makes it easier for study participants to think about it and express their options.

Several authors reported (Dickinson et al. 2007) it is not easy to keep a focus group of elderly people focused on the subject being discussed. Unfamiliar environments and social meetings with unfamiliar people may exhaust users really

quickly. To overcome such problems we will conduct the focus group for the e-health services in participants' premises, where they are in a familiar and safe environment. Focus group participants will be selected among relatives and friends i.e. they will know each-other from before. This will provide an atmosphere in which participants will be encouraged to value their own opinions, express themselves honestly, and enjoy their experience.

Traditionally, when doing card sorting, users are asked to sort cards with pieces of information or tasks into meaningful groups. In order to make the method easier and more inspiring, we will introduce some game elements in the card sorting method. For example for an e-health service named MedReminder the modified card sorting technique will include a set of ten cards, each labelled with a different decision, such as: enter medicine name, watch the nurse, call a relative etc. Every participant will receive a set of ten cards. The researcher will then describe possible case, for example: got new medicine, need instructions for the medicine, or emergency. Afterwards the researcher will ask the participants to select five or fewer cards and rank them according to their importance in the specific case. All selected cards will be then put on the table anonymously for participants, respecting the order of importance of the cards in each pile. For each case, the cards will be photographed together in order to analyse occurrence and order frequencies.

Widely used interviews present a guided conversation in which the researcher seeks information from the user depend a lot upon users' self-reporting skills. Elder people with little experience with modern technology may find it difficult to identify and report anything other than a general impression, such as "I think this is complicated". Confusion among older beginners is often general, poorly reported and non-specific. To overcome this kind of problems, we will make sure that study participants have appropriate technology close to hand. For example, a TV set where the MedReminder service will be available. This will allow study participants to demonstrate their use of MedReminder, which is much easier than trying to describe it with words.

Questionnaires are another type of method, regularly used by researchers when conducting user studies. The problem that appears with elder people is they are more likely to use "don't know" responses to questions that have complex syntax or are semantically complex (Dickinson et al. 2007). Additionally, most of the questionnaires include technical terminology that elderly people do not use in their everyday lives and because of that are not familiar with it.

For example, the fifth item in the SUS questionnaire is:

I found the various functions in this system were well integrated.

To obtain usable results, we will modify both questionnaires (SUS and AttrakDiff) in a way that we will use terminology understandable by the elderly. Furthermore, we will try to use sentences and questions that are syntactical and

semantically simple. After the modification, the fifth item from the SUS questionnaire will be:

I found various functions in MedReminder are well connected together.

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