

Measures and tools for supporting ICT appropriation by elderly and non tech-savvy persons in a long-term perspective

Claudia Müller, Dominik Hornung, Theodor Hamm, Volker Wulf
University of Siegen
{claudia.mueller, dominik.hornung, volker.wulf}@uni-siegen.de,
theo.hamm@yahoo.de

Abstract. Appropriation work of new media by the elderly who do not possess experiences in information and communication technologies (ICT) and related support of their acquisition of media competencies are in focus of this paper. A study based on ethnography and action research aiming at examining elderly and not tech-savvy persons' first steps in their appropriation of tablet PCs and internet applications is being provided. On the basis of socio-constructivist learning approaches we outline specific obstacles and constraints in the set-up of an appropriate learning environment for elderly ICT novices.

Introduction

Research work in the field of Ambient Assisted Living (AAL) to enable ageing at home is in most cases directed towards physical and cognitive problems associated with ageing and accordingly, ICT support is being developed to improve home care arrangements between different stakeholders, such as the patients and the care networks. Only few projects explicitly deal with the social side of elderly persons' wellbeing in a community perspective (e.g. Aarhus et al. 2009; Mynatt et al. 1999) which builds the ground of this paper. We report on

action-research based activities aiming at building a basis for collaborative learning between researchers and non tech-savvy tenants of a local neighborhood.

The activities reported on here are a part of a large-scale and long-term participatory design project directed to the development of a neighborhood portal for tenants of a local housing complex in a German city. The neighborhood portal is one attempt in a set of socio-technical measures to support social interaction, awareness and informal help in the neighborhood. The focus of this paper is the work the ‘design team’ consisting of researchers and elderly tenants had to do to build up a common realm of imagination towards the roles modern technologies could play in the elderly’s every-day lives in the future. Subsequently, appropriation and learning strategies are important themes which, however, have not been much discussed so far for the ‘ageing at home’ context.

Due to the demographic changes of our societies and the focus on ICT support in every-day contexts to leverage social problems in the elderly such as the increase of social isolation and decreasing societal inclusion, research on media learning and appropriation of new ICTs by the elderly is a topic which becomes increasingly important. However, appropriation of new media by elderly people non-affine to ICT and their acquisition of media competencies are objectives which have not been examined a lot.

We report results of an ethnography- and action research-based study focused on elderly and non tech-savvy persons’ first steps in the appropriation of tablet PC and internet applications which may contribute to their quality of life in the sense of getting new channels to communicate and to stay socially connected and informed. Since two years we regularly meet a group of elderly people in bi-weekly workshops and support as well as observe their appropriation processes of the new media.

To make sure the elderly tenants may as well benefit from the online portal and will be able to contribute to this digitally-based channel of ICT, the workshop series has been introduced as a learning forum to help elderly to get access to the new media.

Methodologically and conceptually speaking, we ground our work in socio-constructivist learning approaches (Andresen et al., 2000; Baker et al., 1999; Stahl et al., 2006; Wegerif, 2006), which focus on informal and social learning, such as Communities of Practice (CoP) (Lave & Wenger, 1991).

Wegerif (2006, p. 1) postulates for younger learners in the networked society that it becomes more and more important “*to teach flexible thinking and learning skills, particularly to create skills of learning to learn*”. We see this equally important for elderly people trying to approach the new media. However do we see certain obstacles and constraints in contrast to younger users of the Internet and devices in the media uptake and learning processes in the elderly who so far did not have contact with digital media. For this specific group of learners we identify several themes and obstacles, which are in stark contrast to concepts,

tools and methods aiming at knowledge and competence building of younger learners in school or professional settings. In this paper we would like to shed light on the following objectives which seem to need special discussion for the elderly:

Firstly, how to tackle the challenge to get elderly people motivated to start a learning way of new media and secondly how to set-up a socio-constructivist learning environment, which in the case of the elderly must be deeply grounded in their everyday life interests, needs and wishes. From here then, we wish to discuss the balance which needs to be found between learning offers of general and specific, practice-based knowledge. Finally, the question of how to build-up a sustainable framework for the elderly's appropriation and learning support is of utmost importance against the background of the learning capabilities and interests of the very target group.

Related Research

Human-centered technology research and learning theory both have been motivated by and grounded on cognitivist assumptions and theories (Bannon & Bødker, 1991; Stahl, 2011) for several decades.

Vygotsky's and Leontiev's influence via the inclusion of Activity Theory into these fields of research shifted the focus from individual's mental processes towards group interactions (Bannon & Bødker, 1991; Engeström, 1987; Kuutti, 1995), communication (Wegerif, 2006) and the role of artifacts as mediators of informal learning as well as bearers of highly contextualized knowledge (Baker et al., 1999; Bannon & Bødker, 1991; Stahl et al., 2014; Suchman, 1987). The shift from analyzing internal mental processes towards social interactions involved developing new methods in order to adequately describe and frame the observed phenomena.

Lave & Wenger (Lave & Wenger, 1991) coined the term of Legitimate Peripheral Participation (LPP), which is based i.a. on Vygotsky's zone of proximal development (Vygotsky, 1978), in an effort to describe the highly social process of gradually integrating novices into an established community by taking part in their ongoing practices, routines and habits, thus being able to adopt and refine skills, informally learn basic principles and develop an identity inside the community.

As a framework for establishing LPP as a praxeological concept Lave & Wenger introduced the concept of Communities of Practice (CoP) (Lave & Wenger, 1991) with its three keystones a) joined enterprise (an overarching community goal); b) mutual engagement (connecting all members to a consistent social entity) and c) shared repertoire (development of common language, values, and resources). CoP are well cited in human-centered ICT research (Draxler et al.,

2012; Rohde et al., 2007; Stahl, 2011) as well as in learning research (Hung, 2005; Rohde et al., 2005).

Under the term of technology appropriation researchers describe suitable measures for the support of successfully adapting certain artifacts to a certain practice, a crucial process regarding the acceptance and future use of technology (Overdijk & Diggelen, 2007; Draxler et al., 2012; Stevens et al., 2010).

The abovementioned influences are discussed under the theoretical frame of (social) constructivist learning, which partially supersedes the earlier concepts of cognitivist, instruction-oriented learning and teaching. As a result informal and situated learning in the form of problem-based (Wood, 2003) and technologically enhanced (Jahnke et al. 2014; Twidale et al., 2005) learning settings, as well as a growing interest in practice-based approaches (Kuutti & Bannon, 2014; Wulf et al., 2011) fuel future research opportunities in human-centered and collaborative ICT research fields such as CSCL, CSCW and HCI.

As Beringer et al. (2011), Ekeland et al. (2010) and Müller et al. (2012) describe an anchoring in real practice, i.e. in actually occurring problems and existent habits, is a crucial aspect not only in working with elderly people and ICT but also in elderly education. The researchers claim that former assumptions should be superseded where seniors themselves are seen as problems due to their alleged bodily and mental restraints and argue for a wider implementation of qualitative methods, like action research (Lewin, 1946, Hayes, 2011) and participatory design workshops (Bødker, 1996), in order to gain a deeper understanding of seniors' everyday lives.

These measures in combination with technologically enhanced, collaborative learning settings on the one hand provide much deeper insights in seniors' everyday lives for research and development, on the other hand empower the seniors by offering learning possibilities and enhance their lives by supporting the appropriation and use of technology. Current literature provides very few examples of successfully implemented long-term projects with ICT and seniors (Mynatt et al., 1999; Naumanen & Tukiainen, 2009).

Another challenge for the development of training and educational measures for home based systems is skill development regarding digital literacy (Kommers 2010), a problem, which often applies not only for non-professional home contexts (elderly patients and elderly spouses as informal carers) but also in care professions, which are often additionally gendered (women are more often lacking ICT competences and familiarity due to socialization processes).

A further important aspect is the inclusion of social media to enable social and organizational embedding of learning tools to support negotiation processes between people and motivate contacts and communication rather than this can be done by only documents and learning artefacts (Richter & Koch 2008). In many practical situations these potentials can only be gained by securing privacy and intimacy (Löser & Herrmann 2011), thus a combination of open and closed

learning arrangements must be aimed at. First research agendas of the integration of social media in e-learning have been developed by Greenhow (2009) who focused on in-situ-learning and everyday-embedding or Kafai & Peppler (2009) who researched into the linking of smaller learning groups and bigger groups of interest.

Setting & Methods

Our work with seniors is based in a participatory design project of the development of a web-based neighbourhood platform together with a housing company and a group of voluntary, interested tenants in a German city quarter. All of these tenants are between 60 and 86 years of age and without initial knowledge in the area of new media and ICT. The platform offers several possibilities including a digital bulletin board, a platform for local professional services to present themselves as well as a communication network for the tenants to ask for or offer help, organize social events and exchange goods.

Before being able to invite the elderly tenants to become partners in a participatory design project who did not use new media and – for many of them – were initially not very interested in the media topic, we firstly were challenged to get them interested and motivated and to enable them to evaluate if the new media practices would be fitting to their every-day practices. This is to say that before a participatory design process could be started, we had to open up a shared space of thinking and of possibilities of futures practices, for both sides, the elderly tenants as well as for the researchers who needed to learn about their interests, needs and daily practices. This process was being accomplished for about 9 months.

First of all this appropriation and learning approach involved introducing the 10 participants to mobile devices, mobile applications and certain web-based technologies in order to develop a sense for the technology. We provided them with tablet computers accompanied by an introduction to the very basic handling of these devices as well as providing opportunities to discuss and solve specific problems that they faced when using the tablets at home. These measures were complemented by informal chats about topics of interest for the elderly people in order to get to know their daily live routines, hopes, fears and wishes.

The participants gradually explored certain features like photography, photo sharing via email, instant messaging, video conferencing and usual web browsing, always supported by our expertise and grounded in their daily lives (we will elaborate further on this below in the empirical section). We observed the ongoing appropriation process of the seniors with the tablet computers and mobile applications in biweekly workshops in a community room of the housing company situated next to the housing complex. In total we conducted about 50 regular and three larger-scaled workshops up to now. After the first 9 months of work with the tablets, we were able to take up discussions dedicated towards the

development of the neighborhood portal. From that time on until today (altogether two years now) the workshop topics alternated between technology appropriation/learning and portal development, following an established structure of one hour of “troubleshooting” and informal chatting with coffee and cake followed by the actual workshop for another two hours.

The overall methodology combines elements from qualitative data analysis (Flick et al., 2004) and action research (Lewin, 1946, Hayes, 2011). From the beginning, project reflection, activities for learning support and idea generation for the portal design were framed by means of theoretical sampling regarding data collection, documentation, open coding, analysis, reflection and further planning. The documentation mainly consisted of interview transcripts, field notes and photos, as well as artifacts like screenshots made by the participants and email or instant messenger conversations. The larger-scaled workshops were additionally documented by partially transcribed audio and video recordings.

Empirical Findings

Getting access and fostering motivation

The first contact to elderly tenants was established at an assembly of the tenants organized by the housing company. We were able to casually chat with some attendees in order to get in contact with potentially interested people. After the first tenant assembly, we joined a regular activity called “coffee and cake with the caretaker”, which had been established by the local caretaker as an offer to elderly tenants to come together and chat. We deliberately took this chance to get in closer contact to the mostly (up to 15) elderly participants regularly visiting this event, after some first experiences with a high skepticism and reluctance towards the technology issue. In the course of these meetings, we brought some mobile devices and demonstrated and discussed different usage possibilities, based on the ongoing informal talks about the seniors’ everyday lives.

When some elderly tenants signaled interest in getting deeper into tablet usage, we started to organize an own bi-weekly workshop in the community room, commencing the “tradition” of starting the sessions with coffee and cake (see Figure 1). At that point of the project, we also were able to hand out mobile devices to about 15 interested elderly people. The workshops were essentially aimed at spanning up a bridge between actual practices of the peoples’ conduct of every-day life and the ability to imagine possible futures of meaningful ICT support, i.e. to span up a shared thinking space of future possibilities (in a similar vein as, e.g. described by Brandt et al. (2010).



Figure 1. Coffee, cake and cooperative technology exploration

Two essential features are the basis of the workshops: First, the handing over of off-the-shelf technology and support in individual and group-based appropriation, which is strongly linked to the persons' every-day life issues. Second, based on subsequent diffusion of technology usage meaningful to the individuals, an engagement in concrete participatory design sessions can be started. The final goal is then to bring the former participants to a status where they possess a certain level of skills to operate the technology in for them meaningful ways, and perhaps more importantly, to get over their skepticism, anxieties and negative self-images in respect to new media and instead foster their pleasure to see themselves as capable and important contributors to the design project.

We chose off-the-shelf tablets and smartphones so that the participants could benefit from a huge app repository and many sources of support. Additionally, they could get used to touch-sensitive interaction which is important for the use of the outdoor displays which show the neighborhood portal in front of the tenements. A third reason for the selection of off-the-shelf technology versus custom software is to foster sustainable usage after the end of the project. As many persons in the social networks of the elderly participants (such as children, grand-children or neighbors) are meanwhile used to mobile devices, they are being seen as one possible way to get help in case of trouble with the device.

Co-constructing “anchor points”

In order to elicit “anchor points” to bridge their actual every-day practices with the new media, we ground our work in subsequent dialogs about their everyday life contexts and how ICT might contribute to their quality of life. In the beginning, we started with a demonstration of simple photo and video functionalities on the tablets because some of the elderly had brought pictures to the workshops in order to show us their families or places they liked, such as their former favorite holiday destination or their former hometowns.

We took this notion and started the presentation of the tablets with introducing the photography features, i.e. how to take pictures and videos, how to save and find them on the device. As this practice was being perceived as both, very easy and joyful, taking pictures and making videos became a major issue for the next couple of weeks (see Figure 2). Next, some participants wished for the possibility to exchange their pictures, because, as one said: *“It is a pity. I am never on the pictures I take myself. And Hilde has all the nice pictures of me.”*



Figure 2. Participants taking photos with their tablets

This was an excellent starting point for introducing the concept and use of email, including the creation of an email account for everyone. The participants learnt that email is an excellent way of contacting grandchildren, children and friends and when the feature of attaching a file was explained and understood by the participants the possible use of email developed to become manifold. However, it also became evident that constant repetition and usage of the medium was necessary and a key to understanding and memorizing the functionalities.

Nowadays, for most, writing and receiving emails is not a novelty anymore but has become a part of their live and a contribution to their quality of live.

Stepwise introduction of online features and mobile apps

Other starting points for the increasing use of online features included sports or cultural events such as Formula One races or the Eurovision Song Contest. Especially for the male participants the soccer scores are of interest and the ability to have in-depth reports on teams, coaches and games are highly appreciated and are a clear motivation to use the tablet in their home environment. Another popular app was a companion app from a TV station, which was introduced by a participant, providing in-depth information on shows and the TV program. The lady had played around with her daughter on the tablet and the daughter then had installed that app for her. After the lady demonstrated her new app to the other participants some of them were interested in having that app themselves. Interestingly, the app was even downloaded by a participant who did not even watch the station, but who wanted to be able to participate in the chat on that topic.

By this, new themes emerged for the neighbors who were not that familiar to each other and they started conversations that were not possible before. Downloading apps was found to be rather easy and very handy, hence the other participants quickly started downloading a variety of apps by themselves. Most participants are well versed in downloading apps now while always avoiding charged ones, still being afraid of additional charges, which they might not have been aware of. Often, they wait for the next workshop to ask us to be sure the app is cost-free. This means, that sometimes they do not take up these new veins for some 14 days until they again have the chance to ask us and make sure they will not be charged.

Taking the clues from the group to create adequate learning points has been crucial in maintaining a keen interest in the new possibilities and motivation for further learning experiences. A further need was created when one of the participants discovered an app to create collages of photos. She had seen the possibilities when she was visiting her son. This idea was picked up by the group, so we ran a workshop dedicated to this particular app. As the app is only available in English we translated the buttons and features for the group and additionally prepared a short handbook providing screen shots of every interaction step with the collage app, which could be taken home by the participants to practice further after the workshop.

In one of the workshops we heard that one of the participants has a daughter-in-law living on the Philippines. She told us that she was sad that they could not talk a lot together on the phone, as she was not yet fluent in German and still learning. We introduced Skype to her so she could try it out at home. In the

next workshop she reported that they had talked and also used the chat feature, which enriched their communication enormously. This was such a practical example to the group that now all of them have installed and use Skype to communicate with family members who are not living in the vicinity. The possibility not only to communicate verbally but also to see the other person hit off incredible well with the group and has extended their imagination to the possibilities to ICT.

As we always start the workshops with coffee and cake, baked by one of the female participants in turn, and one of the researchers is vegan, so he cannot participate in the common meal, the ladies regretted this. In the next workshop two ladies proudly presented a vegan cake and told us that they first informed themselves about what it means to live vegan on Wikipedia, and then browsed for vegan cake recipes on YouTube. Here we could observe how quickly their abilities to conduct online research and gather information on new topics have improved when a clear motivation was at hand.

Another anecdote where a participant had seen a huge benefit in using the tablet was when she started to send daily photos of her holiday to the group and maintained a communication throughout the stay. Besides increased options for information, communication and staying connected, also direct improvements of problems in every-day life were being observed, e.g. when another one ordered spare parts for her wheeled walker online.

The possibility to see their neighborhood area from a birds-eye perspective via “Google Maps” is another example how important it is to take the individual interest of participants as starting points for learning. After they discovered this feature they all first showed the group which ways they usually take and extended the concept to show each other where they grew up. When a new researcher was introduced to the group one of the ladies took him on a virtual tour through her home village and showed him where she had lived, went to school and where the beach was for swimming.

Self-actualization and biography and reminiscence work thus is another feature much loved and needed by the elderly people which is enormously being supported by means of new media and internet. Yet, these new abilities also permanently create new problems: *“How do I access the wifi in a Hotel?”* or *“Why do I not have access to the internet at every point on an island?”* For these kinds of problems we provide individual help in the first part of the workshops, the “trouble shooting” session.

Changes in attitudes towards the new media by ongoing practice

Besides observing that the elderly successively integrated the new technology in their individual every-day life context and by this, how their disinterest, anxieties and barriers towards the new media subsequently decreased, we also were able to

observe a change in their overall attitude. In the beginning of our work we often were confronted with utterances such as

“It is nice that you want to teach us to use these new technologies, but as we are old it might be of more worth for you to work with the young who really need these skills in school or on their job!” or “I do not know if this is good for me, what will other people think when I as such an old person am running around with a tablet PC. I think it is a bit embarrassing.”

This confirms research results on attitudes towards ICT by elderly people and hence a high degree of self-marginalization of the elderly when reflecting their active integration and contribution in participatory design projects (Müller et al., 2012). However, by the subsequent processes of sense-making of ICT usages in their every-day life circumstances, also a process of change of identity as an ICT user occurred. In contrast to the peoples’ shyness and reluctance in the uptake of the tablet usage, today we see them being proud of having mastered their first steps of appropriation of the technology:

“I was at my grand-daughters 20th birthday and her friends looked at me and probably thought:’ what does this old lady do with that tablet?’ When I took all these pictures they saw they were really nice and asked me if I would send them. That was fun for me!”

In the last months we have seen a definite change in the way our group utilizes new technology and how much self-esteem the individuals draw from these new abilities. New subjects and themes are sometimes researched in online searches by the individuals themselves. Some participants are very good at baking cakes and have expanded their knowledge by referring to internet pages. Another is taking tips and hints from the internet for handcrafting her own Christmas decoration. This is her own interest which she now can pursue by herself and thereby adding a new dimension to her life (Figures 3 and 4). For those participants, the ‘decorators’ and ‘bakers’, the workshops have the additional purpose to serve as an audience which is always pleased to receive the nice table decorations. Likewise the self-made cakes are getting a lot of praise which the single-living participants do not get so often.

We see that the mastery of conducting internet researches is then linked to other more ‘traditional’ skills which both in a sum are highly acknowledged in the group.



Figure 3. Self-made christmas decoration and cake

Self-help measures: Face-to-face, manuals and tools

Reflecting about measures for self-help when tablet usage problems occur, is an important task since the project resources only allow us to meet the group bi-weekly and as well as in regard to the end of the project in six months from now. With the increase of the usage in their home environments the usage problems increase alike, resulting in a lot of questions and problems that have to be discussed in the workshops (e.g. notifications about updates in the apps). Sometimes, the participants experience the problems as such gravely that they stop using the tablet until the next time they see us. Thus, we developed some methods and introduced tools to bridge the time span between our bi-weekly face-to-face meetings.

As the participants may keep their tablets after project end and utter the wish to go on in their usage and learning process, we need to think about an appropriate long-term support. This, as a keystone for the project success, involves establishing routines whereby the individuals are able to solve any upcoming problems either themselves or are able to ask other persons or resources for help. Therefore, aids were introduced to the group since the beginning of the project in form of individual as well as group level support.

Language issues

Initially the group had to learn a whole set of new vocabulary and a plethora of new concepts. As the group is composed of native German speakers the difficulties can be easily seen as many terms are English – even in the German help sections of manuals. Hence the first step was to create a list of translations and explanations in paper format. However, it sometimes is hard to find the right

balance between going on with a (rather established) English term or a German translation. In some cases, people memorize English terms very easily, and then do not feel that the translation is necessary. An example is the handling of the term “screenshot”: when we explained the concept of screenshots and used a German term, this resulted in the group going quiet, looking at us and saying “*You mean screenshot. Why don't you say this?*” This shows that we have to handle a balance between common ICT terms and specific adapted terms for people lacking the knowledge. When the participants understand the terms against the background of their practice and integrate them in a sense-making process, then the general terms are being accepted – and even wished for. This demonstrates the successful learning curve from their point of view and it fills them with pride that they are capable to participate in this “technical speech” environment. In addition, we offered a diverse portfolio of aids to our group apart from simply translating if necessary. The key to understanding the use of the tablet, apps and portal are discussions with the group and individuals where we try to explain the frameworks and concepts needed to understand modern IT based technology. Without a very basic understanding of these only one-time solutions can be offered.

Handbook

Therefore we have written a handbook explaining the basic functions of the tablet with sufficient screenshots from the original tablet. The intention of the handbook is to provide the individuals with a short manual explaining basic functions to use at home. In order to help individuals with specific problems in handling apps or the tablet we have created stencils of the tablet where we can draw and include annotations during the workshops. Here, we use a pattern we often observe: the people often use notes and write down the solutions given by us to be able to read them and repeat the related tablet interactions later on at home. When we see that a specific way of problem solving is of interest for others, too, we approach that in one of the following workshops, so they can help each other when they need to repeat the way of problem solving (e.g. in the handling of a specific app) later on.

Individual help strategies

As the group has progressed in using different media of communication such as email, *SKYPE* and *TELEGRAM* (similar to *WHATSAPP*), we were able to introduce these channels for asking us or the group for help. Based on this, we exercised making a screenshot and sending it. This supported the demonstration of a usage problem and its explanation. Before the participants were capable to use the described channels and tools for asking for help we had offered a support hotline for some hours per week where they could call in case of questions or problems. This hotline was used very rarely because describing problems on the telephone seemed to be rather impractical and beyond their capabilities.

One typical source of tablet usage problems was the change of the user interface after a software update. To date most members of the group wait for the researchers to explain the changes or to help them to get the “old” interface back. It often happens that they feel that it was their fault that the interface changed by inadvertently changing the settings of an app. As the people only then are interested in learning new issues when they are of direct relevance to their everyday life, they are not much interested to dig deeper into the ICT framework and to learn about why e.g. updates in general are important and they do not see a point in the change of interfaces which for them seem good when they are being understood by them.

As we had chosen the way to set-up our work on off-the-shelf hard- and software, we always have to deal with the need to leverage the newly learned skills and the changes brought by the software providers. This problem can be exemplified by a problem which occurred with GMX mail. One of the participants had problems accessing her email account via the internet but was able to access via the GMX app. The website reported general log-in problems but also GMX had run an update. After checking the status of the updates and updating the browser the problem remained. Only after de-installing and re-installing the app, the problem was solved. We spent two days chatting and calling each other to solve the problem. In the end her neighbor suggested the solution.

This provides an example of individual help strategies which they now can use to solve problems by themselves. They have learned sufficient terms, concepts and vocabulary so that they can ask for help and search out different sources for help in order to solve their problems. In fact they are self-assured enough now to ask people outside of our group for help and to devise their own help strategies.

An additional source of help is a SAMSUNG app which involves calling a cost-free hotline and downloading an app which enables the hotline to enter the tablet directly. Naturally, they will only deal with problems related to the tablet and pre-installed apps. But using this system requires first of all trust and an adequate usage of terms. The problem was that after an update the screen-shot function had been changed. Therefore we decided to use the help-line instead of searching for button ourselves. We sat down with one of our more experienced users and downloaded the app and then called the help-line. Here the main problem was one of trust and the fear of incurring unwanted costs. Only after we insured her twice that it actually was cost free, she was willing to make an assisted call. After SAMSUNG had shown and explained the solution she was pleased with the result and now would be willing to call without assistance.

Discussion

The set-up of an environment for elderly people in order to learn to manage a mobile technology, such as a tablet computer, encompasses a lot of aspects which

already have been reported in work on informal learning environments based on socio-cultural theories of learning, such as e.g. in (Lave & Wenger, 1991; Stahl et al., 2006; Wood, 2003). However, for the target group of elderly and not tech-savvy people there are certain aspects which we think need further consideration, such as finding ways to raise interest and motivation to get in touch with new media, social learning issues and appropriation support. In the following, we make use of the concepts of Legitimate Peripheral Participation (LPP) and Communities of Practice (CoP) (Lave & Wenger, 1991) and the scaffolding metaphor (Hung et al., 2005) to analyze potentials and barriers to building up a social learning environment for elderly ICT novices.

Experience-based and open-ended formulation of a joint enterprise

A joint enterprise is a major basis for learning partners to be able to exchange knowledge or, in the case of vocational training, to gradually grow into a professional group by legitimate peripheral participation (Lave & Wenger, 1991). By means of the pre-defined project goal of co-developing a neighborhood portal, we had not been able to get elderly tenants interested in cooperating with us because we were lacking a common realm of thinking in regard to their possible future ICT support. That's why the initial pre-defined joint enterprise had to be extended: in order to be able to talk about design decisions in a participatory design sense, another joint project in setting up interest and motivation for technology usage and to learn first steps had to be set up. Here, the joint sub-project enabled the researchers to learn about the tenants' everyday practices, their thoughts, wishes and needs, and this was then a basis for suggesting ICT support which was valued as meaningful by the participants in form of an ongoing dialog. Thus, in the first couple of months, the researchers had to carefully bring in usage options based on the "anchor points" they derived from ongoing dialogs with the workshop participants on their every-day life.

Dealing with the problem of a missing common repertoire

An important facet of a shared repertoire in a CoP is the shared language and the terms being used in the field of learning. This is lacking here to certain extents and we have to accept that the two parties – elderly tenants and researchers – will never come to the end of sharing a common repertoire, which will contribute to an autonomous usage of the tablets by the workshop participants. This is a special problem of people not being able to speak and understand English – and based on this the IT terms – which is quite common in the elderly generation in many countries and is one of the major barriers to ICT adoption. There are attempts in designing special elderly-related tools, which provide only limited access to Internet applications, which then may be controlled for their usability and choice of terms being used. We – in contrast – have chosen to work with off-the-shelf

software and hardware in regard to a coming project end and the related chances to substitute our help by other media users being capable to help from their family and friend networks. This choice certainly has its special costs and constraints as long as software and hardware providers do not pay special attention to the elderly customers' appropriation needs.

Another important aspect here is the reflection of the question of what 'should the elderly learners learn to be capable to manage their tablets autonomously?' We perceived here certain limits: as we have seen that learning in the elderly must be closely linked to sense-making processes embedded in every-day practice anchor points, we will not be able to provide them with a 'curriculum' covering all possible usage options (and troubleshooting strategies) so that they may act autonomously in the future. There will always be a difference in the knowledge, and the 'common repertoire' we strive for, is strongly constructed by the researchers. However, we are still developing a common repertoire, which may be limited, but nevertheless useful for the individual learning paths of the participants as well as for the set-up of a collaborative thinking space of future possibilities for the overall design approach.

Mutual engagement to identify "anchor points" and to raise pride in the own practice

The notion of mutual engagement is a concept that points at the highly relevant need to step into an ongoing dialog with the elderly. Only when "anchor points" from their every-day life may be connected by the researchers to technical features and applications, a process of sense-making can start and motivation and interest in learning will be taken up by the elderly. Mutual engagement also depicts processes of development of pride in mastering the new media, which was formerly far away from their every-day life. After constant interaction with the media, the development of a new facet of their construction of identity as a technology user could be observed.

The learning support we provided is most notably appropriation support (Stevens et al., 2010). Only by appropriating an object (such as a software tool) a sense-making process can be initiated. In the case of the non tech-savvy elderly with a high barrier towards ICT based on their reluctance, their self-image and non-available knowledge and usage experiences, the provision of links to their every-day life circumstance were pivotal to open up a common space of possibilities.

This process was based on both, social learning processes among each other in their group, but also triggered by the research team, who subsequently proposed new applications in the dialog with the people. Learning processes thus were positioned on experience-based learning, i.e. the "*appropriation of something that is to them personally significant or meaningful (sometimes spoken of in terms of*

the learning being ‘true to the lived experience of learners’)” (Andresen et al., 2000, p. 2). The lived experiences of the elderly are different environments than in other learning arrangements, such as at schools or in professional settings, and are linked to different learning targets and objectives in dealing with new media. The media landscape on the other hand is rapidly changing. This means we have to balance learning capabilities and interests on the one hand and the rapid media changes on the other. We introduced ways for a general handling of the tablets, but were not able to dig deeper into concepts and frameworks, which then would have been too overwhelming for the elderly we worked with, as the relation to their actual practices would have been missing.

The metaphor of scaffolding as a lens to learning support for elderly and not tech-savvy persons

The ‘scaffolding’ metaphor used in pedagogics seems to be a workable lens to highlight potentials and barriers in the set-up of measures to secure sustainability of learning in the elderly. Some scholars see Vygotsky’s concept ‘zone of proximal development’ as a basis for the scaffolding metaphor, which denotes a process of learning by which “*individuals progress in their skills and experience and gradually require less structure and guidance*” (Rieber, 2000).

Hung et al. (2005) introduce the “scaffolding continuum” (Figure 4), which describes an evolution of a learner from the role as a novice, via an observer and participant to an active contributor in the end, similar to the concept of LPP (Lave & Wenger 1991). Equally is the idea that the need for support in handling the learning objectives subsequently decreases as the learner gradually becomes an expert, which is being denoted as ‘fading’.

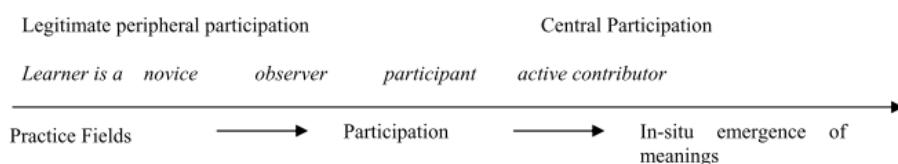


Figure 4. Scaffolding Continuum, Hung et al. 2005, p. 229.

The idea, that a learner in the beginning of his/her learning endeavor is being provided with tools, materials and personal advice by a tutor which in the course of the learning route may subsequently being reduced is only partly realizable for the target group and the learning objectives at hand. As demonstrated, it will be hardly possible to install such a learning environment to support the full process of the elderly learners from being a novice to becoming an autonomous operator of the tablet PCs. In different degrees of intensity all of them will be in need of

support and help when certain problems with their devices occur after the researchers' withdrawal at the end of the project.

In the case of the elderly and against the background of their lacking capabilities and interests in the acquisition of conceptual knowledge in order to be able to transfer their knowledge from one application to another, the focus must therefore be strongly set onto setting up practice-based scaffolds as measures and tools for (self-) help. Instead of aiming at rolling-out a course on the overall features and concepts of tablet PCs and internet usage on the tablets, it seems more sensible to follow the two paths: 1) Setting up appropriation support linked to real and lived experiences to the elderly learners and, 2) Preparing measures, tools and social networks for (self-) help.

Conclusion

We have presented an action-research based project in the context of the development of a local neighborhood portal aiming at supporting social interactions among the elderly tenants. We described specific measures to open up a common thinking space between the elderly and us researchers and a step-wise approach to enable sense-making activities in the non tech-savvy people towards the usage of tablet PCs in the context of their every-day lives. We used the Communities of Practice concept (Lave & Wenger 1991) for the discussion of our empirical findings to make visible some specificities when aiming at supporting ICT learning by non tech-savvy elderly in an experience- and community-based approach.

Acknowledgments

We warmly thank all the participants and project partners for their attendance and endurance in this project. The project is funded by the German Federal Ministry of Family Affairs, Senior Citizens, Women and Youth.

References

- Aarhus R., Aaløkke Ballegaard S., Grönvall E., Bo Larsen S (2009): 'Ageing in communal place: Ethnographic studies of social interaction in senior housing communities', Enhancing interaction spaces by social media for the elderly, *WORKSHOP at ECSCW 2009*, Vienna, Austria, 7 September, 2009
- Andresen, L., Boud, D., & Cohen, R. (2000): 'Experience-based learning', in G. Foley (Ed.), *Understanding Adult Education and Training*, Second Ed., Sidney:Allen & Unwin, pp. 225-239.

- Baker, M., Hansen, T., Joiner, R., & Traum, D. (1999): ‘The Role of Grounding in Collaborative Learning Tasks’, in P. Dillenbourg (Ed.), *Collaborative learning: Cognitive and Computational Approaches*, Oxford: Elsevier Science / Pergamon, pp. 31-63.
- Bannon, L. & Bødker, S. (1991): ‘Beyond the Interface: Encountering Artifacts in Use’, in J. M. Carroll (ed.), *Designing interaction: Psychology at the human-computer interface* Cambridge: Cambridge University Press, pp. 227-253.
- Beringer, R., Sixsmith, A., Campo, M., Brown, J., & McCloskey, R. (2011): ‘The “Acceptance” of Ambient Assisted Living: Developing an Alternate Methodology to This Limited Research Lens’, in B. Abdulrazak, S. Giroux, B. Bouchard, H. Pigot, & M. Mokhtari (eds.), *Toward Useful Services for Elderly and People with Disabilities* Springer Berlin / Heidelberg, pp. 161-167.
- Bødker, S. (1996): ‘Creating conditions for participation: Conflicts and resources in systems development’, *Human-Computer Interaction*, 11, pp. 215-236.
- Brandt, E., Binder, T., Malmborg, L., & Sokoler, T. (2010): ‘Communities of everyday practice and situated elderliness as an approach to co-design for senior interaction’, *Proc. of OZCHI’10*, pp. 400-403.
- Draxler, S., Stevens, G., Stein, M., Boden, A., & Randall, D. (2012): ‘Supporting the Social Context of Technology Appropriation: On a Synthesis of Sharing Tools and Tool Knowledge’, *Proc. of CHI ’12*, pp. 2835-2844.
- Ekeland, A. G., Bowes, A., & Flottorp, S. (2010): ‘Effectiveness of telemedicine: a systematic review of reviews’, *International Journal of Medical Informatics*, 79(11), pp.736-771.
- Engeström, Y. (1987): *Learning by expanding*, Helsinki: Orienta-Konsultit.
- Flick, U., von Kardorff, E., & Steinke, I. (2004): *A Companion to Qualitative Research*. London: Sage.
- Greenhow, C. (2009): ‘Social networking and education: emerging research within CSCL’, in *Proceedings of the 9th international conference on Computer supported collaborative learning - Volume 1 (CSCL’09)*, Claire O’Malley, Daniel Suthers, Peter Reimann, and Angelique Dimitracopoulou (Eds.), Vol. 1. International Society of the Learning Sciences 454-458.
- Hayes, G. R. (2011): ‘The Relationship of Action Research to Human Computer Interaction’, *ACM TOCHI*, 18(3).
- Hung, D. (2005): ‘Preserving Authenticity in CoLs and CoPs: Proposing an Agenda for CSCL’, *CSCL ’05*, pp. 227-231.
- Jahnke, I., Svendsen, N., Johansen, S., & Zander, P. (2014): ‘The Dream About the Magic Silver Bullet—the Complexity of Designing for Tablet-Mediated Learning’, *GROUP ’14*, 2014.
- Kafai, Y. & Peppler, K. (2011): ‘Beyond Small Groups: New Opportunities for Research in Computer-Supported Collective Learning’, *Proceedings of the 2011 Computer-Supported Collaborative Learning (CSCL) Conference*, pp. 17-24.
- Kommers, P. (2010): ‘Education and Lifelong Learning, in: Study on the Social Impact of ICT’ (EU-SMART PROJECT: CCP Nr.55A – SMART Nr.2007/0068, http://ec.europa.eu/information_society/eeurope/i2010/docs/eda/social_impact_of_ict.pdf
- Kuutti, K. (1995): ‘Activity theory as a potential framework for human-computer interaction research’, in B. A. Nardi (ed.), *Context and consciousness: activity theory and human-computer interaction*, Cambridge: The MIT Press, pp. 17-44.
- Kuutti, K., & Bannon, L. J. (2014): ‘The Turn to Practice in HCI□: Towards a Research Agenda’, *Proc. of CHI ’14*, pp. 3543-3552.
- Lave, J., & Wenger, E. (1991): *Situated Learning: Legitimate Peripheral Participation*, Cambridge: Cambridge University Press.

- Lewin, K. (1946): ‘Action research and minority problems’, *Journal of Social Issues*, 2(4), pp. 34–46.
- Löser, K.-U.; Herrmann, T. (2011): ‘Privacy, Trust and the Practice of Learning Management Systems’, *Proceedings of the 2011 Computer-Supported Collaborative Learning (CSCL) Conference*, pp. 811-817.
- Müller, C., Neufeldt, C., Randall, D., & Wulf, V. (2012): ‘ICT-Development in Residential Care Settings: Sensitizing Design to the Life Circumstances of the Residents of a Care Home’, *Proc. of CHI’12*, pp. 2639–2648.
- Mynatt, E., Adler, A., Ito, M., Linde, C., & O’Day, V. (1999): ‘The network communities of SeniorNet’, *Proc. ECSCW ’99*, pp. 12-16.
- Naumanen, M., & Tukiainen, M. (2009). Guided participation in ICT-education for seniors: Motivation and social support. 39th IEEE Frontiers in Education Conference, 1–7.
- Overdijk, M., & Diggelen, W. (2007). Appropriation of a graphical shared workspace: The learner-tool connection. CSCL ’07, 570–572.
- Rieber, L. (2000): ‘The studio experience: educational reform in instructional technology’. <http://it.coe.uga.edu/studio/> (04/30/2015)
- Rohde, M., Klamma, R., Jarke, M., & Wulf, V. (2007). Reality is our laboratory: communities of practice in applied computer science. *Behaviour & Information Technology*, 26(1), 81–94.
- Rohde, M., Klamma, R., & Wulf, V. (2005). Establishing communities of practice among students and start-up companies. CSCL ’05, 514 – 519.
- Stahl, G. (2011). Theories of cognition in CSCW. ECSCW ’11.
- Stahl, G., Koschmann, T., & Suthers, D. (2006). Computer-supported collaborative learning: An historical perspective. In R. K. Sawyer (Ed.), *Cambridge handbook of the learning sciences* (pp. 409–426). Cambridge: Cambridge University Press.
- Stahl, G., Ludvigsen, S., Law, N., & Cress, U. (2014). CSCL artifacts. *International Journal of Computer-Supported Collaborative Learning*, 9(3), 237–245.
- Stevens, G., Pipek, V., & Wulf, V. (2010). Appropriation infrastructure: mediating appropriation and production work. *Journal of Organizational and End User Computing*, 22(2), 58–81.
- Suchman, L. (1987). *Plans and Situated Actions: The Problem of Human-Machine Communication*. Cambridge: Cambridge University Press.
- Twidale, M., Wang, X., & Hinn, D. (2005). CSC*: computer supported collaborative work, learning, and play. CSCL ’05, 687 – 696.
- Vygotsky, L. (1978). *Mind in Society: Development of Higher Psychological Processes*. Harvard University Press.
- Wegerif, R. (2006). A dialogic understanding of the relationship between CSCL and teaching thinking skills. *International Journal of Computer-Supported Collaborative Learning*, 1, 143–157.
- Wood, D. (2003). Problem based learning. BMJ, 326(February), 328–330.
- Wulf, V., Rohde, M., Pipek, V., & Stevens, G. (2011). Engaging with Practices: Design Case Studies as a Research Framework in CSCW. *Proc. of CSCW ’11*, 505–512.