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Past experiences, current practices and future design Ethnographic study of aging adults' everyday ICT practices — And how it could benefit public ubiquitous computing design

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ABSTRACT

This article discusses how the elderly experience their ICT usage as the aging citizens of the Finnish information society. Through reflexive ethnographic analysis the human–(non-) human boundary-making and temporalities are analyzed from the "ICT biographies" of sixteen interviewees. The perspectives of aging as lived experience and as socio-cultural phenomenon; and the socio-materiality entangled with temporal layers; are combined to understand the *intra-action* between the aging ICT users and technology. The social relations are discussed as an essential part of this intra-action: the interviewees perceive themselves as slow and clumsy ICT users in relation to younger "generations", for example. In the boundary making between humans and machines, the interviewees' previous experiences on communication technologies are significant. Continuing on the path set by previous studies on ICT and aging, this article further discusses the benefits of ethnographic study on existing ICT practices for computing design. What could be learnt from these practices in relation to, for example, technology usage in private and public places, negative and positive experiences, motivations and needs of aging citizens? How could design benefit from understanding aging as situated, lived experience; and on the other hand, from investigating research process through reflexive ethnography?

1. Background

Ethnographic methods have been used in technology design, particularly in Participatory Design (PD), since the 1980s. However, the relationship between ethnography and PD has been complicated, and many scholars have developed a combinatory approach to correspond both to the scientific standards of ethnographical methodology, and to benefit design [1–3]. Though some anthropologists have participated in multidisciplinary research programs by evaluating implementations of information and communication technology (ICT) or by practicing PD [4,5], anthropological studies have mostly focused on the appropriation of technology by teenagers or societies without a specific focus on the aged [6–8]. On the other hand, the ways elderly citizens use and experience ICT has been scrutinized in the social sciences through various theoretical perspectives [9–16]. Through my study I aim to integrate these two branches of research firstly by analyzing the socio-material relations of aging adults and ICT; and secondly by discussing how these findings could be utilized in the design of public ubiquitous computing [17,18].

Both the use and the design of technology are embedded in their socio-cultural environment, which means that this environment affects both how people experience using technology, and how the design process is conducted [19,13]. Since my study is situated in the city of Oulu in northern Finland, which has for over three decades invested heavily on high tech industry and thus built its image as the city of high technology [20], I will consider the impacts of this socio-cultural location on the interviews of aging city dwellers. Lately, the city has also

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promoted itself as a smart city where novel ubiquitous computing infrastructure serves the city dwellers in their everyday tasks. New computing technology is deployed in downtown Oulu in the form of interactive public displays and public open-access network, for example. In our anthropological studies, we have previously scrutinized for whom the novel ubiquitous computing technologies are actually designed, taking into account that the official aim of the design has been to improve everyday lives of all citizens, including the elderly. The design of smart Oulu has, so far, been technology driven, and therefore it is important to ask, how could the needs and desires of, for example, aging citizens be considered in future designs [21–24].

The main ontological principle of cultural anthropology is the understanding of humans as socio-cultural beings. People act through the socio-cultural norms surrounding them, like the norms related to "proper" aging. However, people can sometimes resist the prevailing norms and through their practices change them. Secondly, in anthropology it is also essential to contextualize the phenomena under study. For example, culturally and personally constructed boundaries between private and public spheres together with social relations and personal histories affect how people use technologies in public [22,17,3]. Thirdly, anthropological study aims to understand the world from an insider's point of view [6], which in the case of my study means the perspective of aging city dwellers. To reach this goal, the starting point of a study must be the everyday life of people which is then carefully scrutinized through ethnographic methodology. A complete understanding of the insider's view is, however, not possible, and consequently reflecting on the relationship between researcher and people under study, is the fourth main principle of anthropology [17,25]. I will naturally follow these principles in this article.

Designers aim at changing everyday practices and environments through new technological innovations. Therefore especially the design of *ubiquitous computing technology* ('ubicomp'), also dubbed as ambient, calm, pervasive or invisible computing, where computing technology is everywhere and in everything, but has receded into the background of daily life, requires socio-cultural sensitivity [26,27]. It is crucial to note that unlike technology design, ethnographic study as such does not aim to change people's lives. Nevertheless, it can benefit design indirectly: as Dourish and Bell write: "the domain of technology and that of everyday experience cannot be separated from each other: they are mutually constitutive." These scholars, however, strongly question the use of ethnography only as a range of diverse methods to categorize "users'" various needs, and call for more theoretical ethnography in ubicomp. Dourish and Bell also advise to neglect the common structure of design articles to finish the ethnographic analysis with a section titled "implications for design", since it is against the principles of ethnography [17]. In this article, I will discuss the benefits which my ethnographic study could provide for ubicomp design in the smart city of Oulu; but as an ethnographer I cannot point out any direct implications my study has for design. That is for designers to discover.

2. The aim of the article

The aim of this article is to discuss how an ethnographic study of Finnish aging adults' everyday ICT practices could be used in technology design. In order to answer this question, the ethnographic descriptive analysis is used to understand:

1) the relationship between social networks and ICT practices of the elderly
2) the generational differences and similarities related to ICT practices
3) the meanings of human and non-human relations in these practices

These three themes have emerged from the material through iterative ethnographic readings. In this article, ethnography is used according to its original definition; in other words, it refers to the *epistemological understanding* of the knowledge produced through the research process. Like anthropologists in general, Dourish and Bell underscore that ethnography is not just a fieldwork or data collection method, but a specific understanding of the knowledge production process that calls for reflexive analysis [17,25]. I practice ethnographic analysis in the theoretical framework of both socio-material boundary-making and temporalities because of the nature of my research material, i.e. biographical interviews. The socio-material perspective has not, thus far, been used while studying the ICT practices of aging adults, even though it offers a fruitful point of departure to comprehend the complexity of these practices. It is not just humans who interact in ICT encounters but also non-humans [28,29]. In addition, focusing on temporalities enables me to explain why aging adults experience their relationship with ICT in particular ways. By temporality I thus refer to both the 'experience *of* and experience *within* the passage of time' [30]. Through my study, I argue that to understand the phenomena of aging and ICT, studies should focus on 1) biographical histories related to technology usage; 2) socio-material intra-actions; as well as 3) the socio-material realities that aging adults live in.

As an anthropologist, I examine aging both as a sociocultural phenomenon and as lived experience. From an anthropological perspective, these two sides of aging are inseparable: how individuals experience and talk about their aging reflects the social discourses and cultural norms related to the issue. This notion helps the researcher — and technology designer — to understand why the elderly talk about their aging in certain ways. Aging takes place in communities, but Toni Calasanti and Kathleen Slevin [31] have argued that in western cultures aging is often referred to as an action of the individual: somebody has "aged successfully" or has "let herself/himself go". Getting old is usually considered to be something negative, also by aging people themselves, and strategies to avoid getting old are continuously developed. However, as Calasanti and Slevin [31] claim, "societies proscribe appropriate behaviours and obligations based on age." This means that the information society and its discourses of elderly people as "technophobic", or on the other hand as "silver surfers", affect the ways elderly people experience their own relationship with ICT and themselves as members of the information society. When the norm is to be a capable and willing user of new technologies, people have to come up with strategies to fit into this present definition of a good citizen [32].

After presenting the ethnographic analysis of the aging citizens' ICT practices, I will turn back to the question of designing public ubiquitous computing technologies. What can be learnt from the already existing everyday ICT practices

of aging adults, and how can ethnographic study be utilized in future design? This kind of a research process has been used earlier in systems design for work organizations [33,3]; but not in STS studies on aging and ICT. Similarly, the question of how personal home-based ICT usage could benefit the design of public ubiquitous computing has not been studied. It should be noted that in my study the technologies in question are not designed specifically for seniors; rather, they are designed for "everyone". However, since the elderly citizens are not yet using the novel public ubiquitous technologies in the city, I will focus on their everyday ICT practices and their experiences of it. I argue, that it is also essential for designers to ask who is *not* using novel technologies and why.

3. Theory: Socio-material boundary-making and temporalities

In her theory, Donna Haraway underlines objects, especially the body, as "boundary projects" which come into being when people draw boundaries. For her, "objects" 'do not preexist as such'; instead they materialize in social interactions. Thus, the boundaries should always be considered as dynamic and complicated [34,35]. With her agential realism, Karen Barad takes a step further to erase all boundaries between human agents and nonhuman agents, such as materials. For her, all agents are part of the same phenomenon, and consequently they do not interact with each other, but rather *intra-act*. Through these intra-actions "the boundaries and properties of the components of the phenomena become determinate" [36]. Lucy Suchman explains this well: "Whereas the construct of interaction suggests two entities, given in advance, that come together and engage in some kind of exchange, *intra-action* underscores the sense in which subjects and objects emerge through their encounters with each other" ([28]; original italic). In my study, this means for example that in the intra-action of the interviewee and computer, the identity of *aging citizen* emerges, while in other intra-actions this identity might not be visible. Barad's onto-epistemological theory thus considers also the agency of materials, like technology; and I argue that this emphasis is relevant for technology design. World is not a place of stable relations or clear agential boundaries; instead it is in a constant state of "coming into being". Therefore, ethnographic study could greatly benefit design process.

In my analysis, Barad's view has been consciously present while reading the interviews: I consider technology, like computers and the Internet, as active agents in the encounters even though they are investigated through the narratives of human agents. In their speech the interviewees construct these non-human agencies when they talk about, for example, the computer as *acting* or *performing*, in other words, doing something without a human agent. These narratives also reflect the loss of control that the elderly might experience in this intra-action. Consequently, I have focused on the boundary-making in the interviews, where the boundaries are drawn between different human agents, such as different generations, but also between humans and technologies. Occasionally, the interviewees also deconstruct the traditional object/subject boundaries, for example, when they talk about the computer as an agent which affects their lives.

I combine this socio-material perspective of momentary intra-actions with a perspective where the temporal layers — past, present and future — are seen as affecting these intra-actions. I follow Lucy Suchman's notion that 'we need a story that can tie humans and nonhumans together without erasing the culturally and historically constituted differences among them' [28], because it enables me to do ethnographic analysis of the biographical interviews. Aging is tightly entwined with experiencing time, its passing, its scarcity, and its ending. When we experience time all temporal layers become a mesh; therefore we cannot look at it simply as something that only proceeds chronologically. The social and cultural understandings of time affect how individuals experience it. Already in 1997, Jan Baars wrote that "[p]resent-day Grand Narratives about aging are a mixture of huge market interests, budgetary strategies, and generalizations about the aged, who are categorized according to their chronological age" [37]. In addition to this, the biological rhythms, the socio-cultural discourses that define aging, and the intimate experiences of 'living in time' should carefully be considered while studying aging and experiencing time [38]. In my study I also follow the notion of Simon Biggs who says that 'We exist in time as well as in the here-and-now, and any convincing story of age, gender, and identity must come to terms with both' [39]. Consequently, I will investigate both the aging interviewees' previous experiences on communication technologies and their hopes for the digitalized future.

Since ethnographic analysis calls for reflexivity, I comprehend myself as an active agent in the intra-action of the phenomenon I am studying. Haraway reminds us that although the (political) agency of the researcher must be discussed in the research, because the world is not passively waiting for a researcher to find it. Instead knowledge production is a joint event of all human and nonhuman agents; and the knowledge we produce is always partial [34].

4. Research design and methods

The elderly interviewees were recruited from a computer course for aging citizens, which was held at a community center. During my three visits to the course, thirteen people agreed to be interviewed and three of them later brought in their spouses as participants, as well. One of the spouses had never used a computer, and the couple did not own one at the time of their interview. Two of the interviews were made with a couple, the rest being individual interviews. Given that all three courses were female dominated, the material also represents this gender imbalance with eleven female and five male interviewees. The reason for recruiting them through these courses was my interest to study both the elderly city dwellers' views on the information society and stories of their personal encounters with ICT devices. All but one of the interviews were made in the interviewees' home to make the situation as comfortable as possible for them; one woman wanted us to meet in a café in the city center. The interviews were recorded and transcribed verbatim. The two longest interviews lasted more than 2 h (2 h 40 min, and 2 h 20 min); as for the rest, the duration varied between an hour and an hour and a half. Consequently, the analyzed

material was plentiful and the analysis required multiple readings.

The ages of the elderly interviewees varied from 61 to 87. All except two of them had lived most of their lives in Oulu; five had even been born there. Consequently, these interviewees had a long relationship with the city, and they described, for example, the regrettable demolition of its historic buildings, but also the economic growth that followed the high-tech city strategy. Four of the interviewees had academic education; ten had studied in a vocational school or had an intermediate grade; and two had entered the working life directly after basic education. The public sector, consisting mainly of hospitals and schools, had employed eleven of these interviewees; three had made their careers in the industry; and two had worked as entrepreneurs.

The anthropological study aims for a more holistic socio-cultural understanding of humans than, for instance, looking at them merely as users of technology. On the other hand, neither anthropological nor other ethnographic studies aspire to generalizations. In other words, a "case" in a study can include people with very similar looking backgrounds, like education and occupational lives, who belong to the same biological age group and represent the same gender. Nonetheless, a "case" can also consist of people who are all retired but whose biological age difference is almost 30 years, who have different social backgrounds and who represent more than one gender, such as my "case". Ethnographic analysis seeks to present more than one voice, and no matter what the social structure of the research group is, the main principles of the anthropological study can be followed. It is preferable to allow the group of people we study to form itself as organically as possible [3]. For example, when I examine if my research group could be considered as belonging to the same "digital generation", I must turn to the interviews and analyze whether the interviewees identify themselves with a certain generation.

The interviews of the aging citizens were based on the *life story method* [40,41], where the narrations were built around ICTs producing so-called *ICT biographies*. During the thematic interviews, we discussed, for example, the interviewees' experiences of both landline and mobile phones, and the ways the mobile phone had affected their lives. We also discussed their experiences of using the computer and the Internet; their spatial practices in public places, and how technologies were connected to these practices. In previous qualitative studies on aging adults and ICT, scholars have used methods such as time-use diaries followed by in-depth interviews [42], or solely in-depth interviews [12,14] or focus group interviews [43]. So called classical ethnography, in other words long-term observations and conversations with people in their real-life environments [44] have also been utilized, and this methodology has been combined with workshops [45]. Virtual ethnography in online communities has been conducted, mainly through participatory observations [11]; and observations combined with qualitative interviews [13]. Although researchers have discussed temporal layers in their analyses [42,12], they have not explicitly conducted life story interviews. This method makes it possible for me to scrutinize how interviewees' earlier experiences and personal histories affect their current technology usage and the meanings of ICT in their lives. This relation has not yet been studied. Using the life story method while conducting the interviews made different temporalities of the narratives visible, and therefore in my analysis I am able to focus on the temporal entanglements of the interviewees' ICT experiences. This is important when striving to comprehend the reasons behind the interviewees' current ICT usage — and non-usage.

In a biographical interview, the narrator explains how s/he became to be who s/he currently is, as well as how s/he (dis)engages with different social groups. There are many small stories inside the large one, and these stories are connected by the narrator: the stories of childhood reflect the stories of later life, for example [40]. Interpreting experiences from narrations means that a researcher makes an "interpretation of interpretation," argues anthropologist Clifford Geertz. He explains this with the concept of *thick description*, which means the search for the meaning of an action; whereas *thin description* is used when simply stating the action. The classical example comes from the philosopher Gilbert Ryle: in thin description a researcher verbalizes what has happened, 'someone has blinked an eye', for example. But in thick description a researcher also explains the meaning of the blink, which can be a secret code between two people, a mimic, or a physical action without social meaning [46]. How people who are involved in the situation themselves interpret the actions, is thus essential in anthropology. In the ethnographic analysis, it is crucial to read the stories in relation to the other stories in an interview, but also in relation to other interviews. A life story is produced in a socio-cultural environment, which must also be reflected in the ethnographic analysis. In my study, this means that the Finnish information society with its societal discourses about aging citizens; and the high-tech city of Oulu affect the content of the interviews; for example, how the aging interviewees perceive themselves as ICT users and as citizens.

5. Results through descriptive analysis: Aging citizens' ICT practices in socio-material and temporal contexts

5.1. Resilient social networks and new ICT practices

Since the interviews were constructed as life stories connected with communication technologies, the elderly interviewees reminisced, for example, about the time before landlines were linked to every household, and compared handwritten letters with e-mails. I also asked them about the possible changes that the transfer from landlines to mobiles had introduced. Communication in anthropology is understood widely, including different public and private locations and media for communication, along with communication as verbal and nonverbal practices [6]. That is why I examine my interviewees' various practices with different technology related communication, as well as their relation to non-ICT related communication. Most of the interviewees had used mobile phones for more than a decade, except for the couple who had purchased their first shared mobile phone a year before the interview, and who were still using it rarely. Instead, they were using a wireless landline phone. Three men had bought a car phone in the 1980s for their work, or because it was "nice to call your friends from a car", i.e. the phone was both practical and a symbol of being "modern", for them.

Many interviewees recounted how they had received their first mobile phones from their children or other relatives who were worried especially for those interviewees who lived alone

or went to the woods unaccompanied. Like many other Finns, the interviewees went to pick berries and mushrooms in the forest, or did some forestry work on their own piece of land. The mobile phone was given to them as a safety device, and though in the beginning it was easy to — intentionally or unintentionally — forget it home, they all agreed that the feeling of safety offered by mobiles was nowadays important to them. The feeling of security was connected solely with public places, unlike in Horst and Miller's [6] anthropological study on cell phone communication in Jamaica. In their study, cell phones made people also feel safer within their homes: due to the number of crimes in the interviewees' neighborhoods they feared that other people might damage their landline wires.

The couple who were still mostly using the landline also stated that a mobile phone could be handy when the other one was moving around in the city center, or when they were traveling in their car. Regardless, they never brought it along, but sometimes used it at home to surprise their relatives by calling from a mobile phone. They were, however, an exception: the rest of the interviewees considered the mobile phone as such an essential part of their everyday lives that it would be difficult to manage without it. It had made their lives more flexible, and it belonged to "the gadgets that I carry with me" (woman 1936). This related directly to their experiences of their own aging: many described how physical disabilities, like heart and lung conditions, or leg and back problems, brought about by aging, had reduced their trust in their own bodies. In this situation, the mobile phone enabled them to continue being mobile. Everyday mobility was considered by all interviewees as one of the most important issues for them as aging adults.

In addition to communicating by talking on the phone, many women found text messages useful, especially when trying to contact their children while they were at work. The camera application was found fun and especially the pictures of grandchildren were important and often used as background images. The phone book feature was also considered useful, except by a 68-year-old woman who wanted to know phone numbers by heart to train her memory. One woman disliked the fact that mobile phones identify the caller when the call is unanswered. She felt that the feature demanded the owner of the phone to return the call. For her, this kind of "perpetual contact" where you are expected to be constantly connected to others [47] was irritating. On the other hand, many appreciated, or at least did not mind, this kind of constant availability: they wanted to hear both the good and the bad news from their closest relatives and friends as soon as possible, or be connected with their partners and children.

Though the interviewees' social networks had not changed due to mobile phone culture, it had affected the places where they used the phone. However, they were still reluctant to talk on a mobile phone in public places due to a respect for their own and others' privacy. They were annoyed when they were forced to listen to other people's intimate conversations on a train or a bus, for example. If needed, most interviewees used their phones publicly, but only briefly; and some refused public usage completely [22,48–50]. Even though the elderly interviewees valued the portability of the mobile phone, landlines had some superior features compared to it. Many described how comfortable the "old phones" with a good handset were for making long calls while laying on your bed or couch. Some claimed that the reception in landline phones was better even when they compared it to using a mobile phone in a quiet private place. Mobiles could also cause the kind of anxieties that landlines could not because of the possibility of being able to use them in public places. For example, a 64-year-old woman reminisced about the first time she answered the phone on a bus:

> "But I was terrified of answering the phone. I was on a bus and thinking, oh my god what if it rings. And when my daughter called I told her that I can't hear anything while I'm on this bus. I was so nervous that I couldn't understand what she was saying. – – My daughter told me to take it easy now, and put that phone properly against your ear. I have seen you so many times with the phone and it's always placed willy-nilly."

Past experiences of landline phones may still affect current mobile phone usage: a 69-year-old man said he found using text messages difficult because for him a phone was meant just for talking. Compared to both mobile phones and e-mails landlines were still considered to be the most reliable tool for technology-assisted communication; and talking with someone, whether on the phone or face to face, was appreciated more than using "dead e-mail", as a 71-year-old man described it. The interviewees communicated through e-mail mainly with societies they were members of, or companies they were customers of. E-mailing was considered useful when the sender needed to retain a document of the transaction. Some complained about the intensification of e-mailing: in addition to societies, condominiums were using more and more e-mails to inform their inhabitants. This worried some of the interviewees, since not all people have computers and an Internet connection, or are capable and interested in using them, and thus this change could especially marginalize some of the oldest members of society. All in all, e-mailing was quite a new form of communication for many, and it was simultaneously experienced as threatening and alluring [51,14]. The interviewees wanted to learn to use it and to control it, but the insecurities related to both information security and the unreliability of sending, receiving and reading the messages bothered them. No one was using social media, such as Facebook, at the time of the interviews, and only one woman said she was considering joining it. The others said they were too worried about getting hooked on Facebook, or they did not know what it was.

Many of the interviewees argued that their computer usage was low, but when they described what they used it for, this argument became quite contradictory. In addition to e-mails, many used online banking, booked tickets, checked timetables and events, searched for instructions for handicrafts, or recipes for cooking. Google was very popular, and a 69-year-old man who was a very capable and interested computer user, said that he would not need the Internet if Google did not exist. Skype was also used by many, since all of the interviewees had family members, relatives or friends living in southern Finland or abroad. When I asked whether they read newspapers online, most answered that they read some of the headlines online but preferred the paper version because they could read the news more carefully, and that they liked the feeling of paper in their hands, and could

comprehend what was written better when it was on the table. Some had been in the habit of reading the local newspaper for over fifty years, and thus, were understandably quite reluctant to change it to what they saw as a very different socio-material practice.

Overall, new technologies, and especially learning how to use them, raised powerful emotions among the interviewees: the shame of asking the same questions over and over again; the anxiety caused by not being able to use the computer or using it for "too long"; but also the joy of managing to control it. The aging interviewees tended to belittle their computer skills, even though they described their usage as quite versatile. Many scholars have noted the same and claim that this is connected to the ways elderly people are seen in society: if they are seen as an economic and social burden with low computational skills, aging citizens might reproduce this image in their stories of highly emotional encounters with technology [13,15,43]. But even though the aging interviewees considered themselves as being technologically less competent, they still "do it when you have to", as a 64-year-old lady put it.

Despite their portability, the change from landlines to mobile phones had not significantly changed the mundane communication practices or social networks of these aging citizens. Several studies have shown that new technologies are mostly domesticated to serve existing practices and social networks [6,17,48]. My study supports these findings: the interviewees were using their mobile phones mostly for making calls, and they said that they were calling the same people, in other words family members and friends, that they used to call with landlines. Technological changes notwithstanding, their social networks are resilient, which is important to know when designing novel technologies for seniors.

5.2. Different ICT generations?

> "The bloke refused to believe that I had brain, that I understand things, so he gave me the wrong gadget, not the one that I needed. – – And I was so frustrated that I started crying, I said it's shocking the way elderly people are treated like we don't have a brain at all."

This is a story told by 75-year-old woman in which she describes her dealings with a young salesman in an Internet provider's local store. When discussing the relation between experiencing aging and ICT, we could ask what is the meaning of generations for the aging narrators? Do they construct generations through boundary-making? Do they talk about belonging to one or several? And how does their own generation differ from other generations, for example. Different age groups are very relevant in the interviews of these aging citizens of Oulu. All interviewees talk about "the youth" who have had a major impact on the fact that they have purchased the computers, like was the case with mobile phones earlier. Since mobile phones had been domesticated [52,16] to a large degree by most of the interviewees, the meaning of youth was discussed more in relation to computers. While the most important reason for getting mobile phones was safety, the reason why young people wanted the elderly family members to buy computers was to get them 'up-to-date' [12,51,53]. The youth had familiarized the interviewees with computers, and tried to teach them the basics of using them. The elderly narrators had experienced these encounters positively; however, at the same time the situation enabled them to compare their own skills with the youth's. This made them feel that their own way of handling a computer was awkward and slow. Sometimes the interviewees pondered whether they had learnt that much from their young teachers.

The sociological perspective on generations emphasizes the pivotal 'key experience' that has happened during the youth which unifies the whole age group. In his classical analysis on generations, Karl Mannheim [54] relies on the psychological explanation of identification: young people around 17 years are at the most auspicious age for their worldviews to be formulated. In other words, to form a societal generation an age group must share the key experience already during their adolescence [55]. Docampo Rama, de Ridder and Bouma have argued for technology generations which do not correlate with age: "different generations are defined on the basis of rather sudden, discontinuous changes in society such as wars, economic depressions, etc. – – Age effects are different since these are assumed to be rather continuous" [56]. Nevertheless, they consider both age and generation as chronologically linear concepts and underline the importance of the year of birth in their analysis of technology generations.

Biological age is both relevant and irrelevant in my study: the interviewees pondered whether they were "too old" to learn how to use a computer, whether they still "had it in them" to learn tricky things or whether they were too clumsy and not interested enough to learn. Simultaneously, they were convinced that once they concentrated on learning how to use the computer, they could master the necessary skills; that they had the brain but were just different kinds of learners than the younger ones; and that there was nothing really difficult about the computer. The computer courses they had attended were well received: the aging participants had felt respected by their teachers, but more importantly the participants had encouraged each other and made the atmosphere relaxed and approving. The fact that everybody was at the same level was crucial for them. A 75-year-old woman who had participated in several courses by different organizers agreed with the others, stating that: "You can somehow sense it if there is a prejudice against old people, which they [the teachers in the community centre] didn't have, it's immediately evident; it is so interesting how you can tell it from the smallest things."

Thus, the interviewees construct their own image as being clumsy computer users but quite capable learners. In their stories they talk a lot about the older citizens, the older generation, to which they themselves do not belong. This group of people is in danger of marginalization because they might feel incapable or reluctant of learning computing skills, or they might be economically incapable of purchasing a computer and an Internet connection. On the other hand, some of the interviewees told me about their older relatives and friends who felt quite enthusiastic about their computer and the Internet, and who were using both on daily basis. However, more apparent is the boundary-making between

the narrators and the oldest members of the society. With this emphasis, the interviewees do not wish to be identified as "old" or "the oldest" [18].

The interviewees make clear boundaries between different generations but their conceptualizations do not fit in with the above-mentioned sociological understandings of generations as such. Usually when they talked about the "youth", they referred to both their own or their siblings' grandchildren, but also to their own children and their children' spouses. Surely these several different age groups have not shared the same key experience related to (information and communication) technologies in their youth. The Finnish scholar Matti Virtanen [55] who has studied the links between societal mobilization and generations claims that the contemporary time is in a constant turmoil which creates new generations ever more frequently. Yet he agrees with Mannheim that the turmoil is still most intensely experienced in adolescence. I would, however, argue that the constantly intensifying digitalization of the whole society has affected also the people at the age of retirement so strongly that we could talk about them as a separate ICT generation who have learnt — willingly or unwillingly — the basic computer skills to survive in society.

In relation to ICT, the interviewees construct their generation as the "in-betweeners", who are between the highly skilled "young" generation and the uninterested oldest generation. Most of the interviewees were introduced to computers just before they retired or in their early retirement years, and being in such a significant turning point in their lives, has made them experience the digitalization extremely strongly. Some of them said that they got so fed up with the constant demand of learning new computer skills in their late working years that they did not want to see a computer for years. Now they are, however, forced to learn those skills again to "keep up with the world", where most of the official information is online [15]. The only exception among my interviewees was an 87 year-old-man who did not feel this pressure, and who thus belongs to that generation of the "oldest of the old" the other interviewees talked about.

The ICT relationship is constructed both in socio-material encounters and cultural discourses. According to discourses of the information society, the aging citizens are a burden to society due to their assumingly low computational skills [32,43]. This is also reflected in the narrations of my aging interviewees. The stability and strength of these discourses unfolded to me when I read socio-cultural studies on elderly Finns' relationship with computers that were done almost ten years ago [14–16]. It is interesting how this relationship seems so unchangeable: the abovementioned studies show how computerization raises powerful feelings among the aging adults, and they feel forced to and encouraged by their young relatives to become part of the digitalization. Since my findings are almost identical, I argue that the social discourses on the issue have thus not changed. The computer skills of the aging adults may nonetheless have improved. The effects of these discourses are evident: the interviewed aging citizens automatically assumed that their level of knowledge on ICT was lower than younger citizens'. For them, it was a generational difference which made them experience themselves old in a negative sense.

5.3. The human/machine boundaries in flux

The object/subject boundaries, their construction and deconstruction, as well as their meanings have been widely discussed by scholars of feminist technoscience [28,35,36]. How we define "objects" tells us how we define ourselves and humanity, is an important point of departure in these studies. In addition, the idea that all categories and boundaries are in a constant flux, thus they are unstable and even undefined outside the material practices they are part of, is essential. A good example of this is Lucy Suchman's study on "human-like" robots (2011), in which she analyses how these robots are "becoming with" their environment which includes humans. This means understanding the boundaries between robots and humans in new, more entangled ways: "Not only do these experiments promise innovations in our thinking about machines, they also reverberate in generative ways with ongoing refigurings of what it means to be human," Suchman writes [29].

The paths that the narrators of life story interviews travel are long and winding; and occasionally the narrator returns to a path s/he has already traveled and decides to take a counter path [25]. This means that during a quite long interview, the interviewee makes many sorts of boundaries which may contradict each other. While talking about mobile phones most interviewees described it as being a very important part of their lives, something they always carry with them; one woman who was hard of hearing said that she has the phone in her pocket even inside her house. Consequently, the mobile phone is physically a part of these interviewees. In the Finnish language the established popularized word for mobile phone is "kännykkä" which refers to the Finnish word hand "käsi", i.e. mobile phone is something you always hold in your hand, or even an extension of your hand [57,41].

The portability of the phone, and carrying it outside your own home, makes the boundaries between the carrier/user and the machine more vague than they were between landlines and the users. On the other hand, the mobile phone is talked of as an object that the user controls; as an instrument that connects humans to each other. Although one woman said she was a "slave to the phone but not a prisoner", the mobile phone has not really changed the everyday communication practices or social relations of these aging adults. Through being a safety device it does, nevertheless, define these interviewees as aging members of the family/society, it makes them feel like someone who needs looking after and being guarded. Even though mobile phones provide a feeling of safety also for young people, the elderly interviewees in this study connected safety with their own aging bodies. On the contrary, for the young adult citizens of Oulu, safety had to do with perpetual contact: they wanted to be available in case something happened to their family or friends [22]. Overall, the boundaries between humans, i.e. the aging citizens, and machines, i.e. their mobile phones, are unfixed.

The interviewees' relationship with a computer, and thus the boundary-making related to it, is different. Though most of the interviewees either already owned a laptop, or were planning to replace their desktop with one, the reason for purchasing it was not its portability but rather its small size:

the laptop could be put out of sight if deemed necessary. Still many had a particular place for their laptop in their homes. This place constructs a physically fixed boundary between the computer and its environment, but this boundary was experienced quite strongly also while the interviewees were using the computer: they described it as something they could not completely master or comprehend. Many were worried that they could, at worst, destroy the whole system, or at least "mess it up" badly [51,58]. Nonetheless, some were also quite convinced that once they started "socializing" more with the computer they would soon be "on familiar terms". I find this interesting from the perspective of subject/object definitions and boundary-making: on the one hand, the interviewees define the computer as its own almost individual entity which they have to interact with, instead of doing something to it. On the other hand, through their clear boundary-making they place the computer to the fixed position of a machine. In order to be able to loosen this boundary, they expressed the need to understand better how this machine functions.

Many interviewees articulated, to my surprise, a strong will to know why certain things happen when they push a certain button on a keyboard. Though they complemented the course at the community center, they were still looking for this kind of technical information. For example, a 69-year-old man who had followed the development of computers since punch card times through his work, and was still actively reading about the latest novelties, was confused by the extent of the current ICT world, and felt it was out of his control. The way the interviewees expressed their lack of knowledge of the computer and the Internet tells me that they supposed that other — younger — members of the information society knew these things much better. Information security issues worried most of the elderly interviewees, and during the interview they asked me whether they should be concerned for their e-mail usernames and passwords. At the time of the interviews, the media reported about the information leaks connected with large email operators and banks. Some of them were determined not to start using online banking because they did not trust the security of those systems.

Additionally, the local free open-access WLAN called panOULU, offered mainly by the city of Oulu with thousands of access points mostly in the city center and at the university, caused anxiety among many interviewees. Since most of them lived in the city center they were enthusiastic about the idea of using this free access to the Internet with their home computers. Many knew exactly where the nearest access point was located; some could even see it from their window, showing it to me during the interview. The problem was that, for reasons they were unaware of, their computer could not connect to this network, or the connection worked poorly. When panOULU was launched in 2005 to celebrate the 4th centennial jubilee year of the city, the local newspaper informed misleadingly that the network would be available all over the city and thus for everyone. Many elderly interviewees reminisced about this "unkept" promise, but also the current malfunctioning connection frustrated them: 'Yesterday when I tried to send an email, it was so awful that I almost threw my computer to the wall,' said a 66-year-old woman while talking about panOULU. For these aging citizens, the value of this network was first and foremost economic. Their experiences also remind us that the digitally augmented smart city is a home for many [59].

As Donna Haraway writes, the boundaries people draw define both the objects and the subjects. In their narratives, the aging interviewees often include computers and telecommunication networks in the circle of subjects, and while intra-acting with these subjects they construct their own identities as aging citizens whose computer competency is weak precisely because of their age. In other words, their age emerges in this intra-action as a significant agent which defines how they experience using technology. This boundary-making is turned on its head when their narratives deal with mobile phones. The phone does not belong to the sphere occupied by subjects; instead, it is mostly an object connecting human subjects. In this intra-action the significant agents are also family members and relatives, and the age and the aged bodies of the interviewees emerge as a decisive part of their mobile phone use. Nevertheless, these positions are not fixed, as they change according to the context the technology is used in and for. Therefore, understanding these contexts benefits design as well. Taking this to a more abstract theoretical level: understanding the whole phenomenon of aging and ICT usage, in Karen Barad's words, as *intra-action* means acknowledging the agency of technology. This view could also help designers to recognize how devices and other material objects are powerful agents in the use of technology; but how other agents, like family members and social discourses, also affect technology usage and how it is experienced. These intra-actions have a strong impact on how people experience their age and their citizenship.

6. Discussion: Lessons learnt for ubicomp design

The development of the technology rich city center in Oulu leans heavily on the strategy which the city chose to pursue in the beginning of 1980s. The city has invested significantly in the high technology research and development, and consequently it has been an alluring place for high tech industry, like Nokia. Already in 1984 Oulu declared itself as a "city of technology" [20]. This strategy has been successful until recently, and the powerful high-tech city discourse affects all citizens, which is very visible in the ICT biographies of the aging citizens. Hegemonic discourses, like the positive effects of digitalization, are something that everybody somehow needs to react on, either by reinforcing the prevailing discourse, or by questioning and challenging it.

We have elsewhere discussed the design of public ubiquitous computing in Oulu by comparing it with the spatial experiences of both aging and young adult citizens, and underscored the problem of designing for everybody [21,22]. Our analysis on the designers' interviews has shown that the design has been partly based on the idea of young people as early adopters [60] which has been criticized for example by Essén and Östlund. They claim that older users, who are often addressed as 'laggards', should be included in the design to overcome the idea of aging citizens as technophobic and technologically illiterate [61]. Although our study disclosed that some of the designers pondered whether retired citizens might use the novel ubiquitous

computing technologies more than younger working citizens, they mainly suspected that elderly citizens might not be competent and confident enough to start using the displays in a public place [21]. Since technology usage is always dependent on the earlier experiences and the socio-cultural context of the usage, my ethnographic study on the ICT practices of the aging citizens can answer some of the questions that the designers had. Most importantly, are retired aging adults capable and willing to use new technologies and why (not)? And how could they participate in the design process?

6.1. Understanding technology usage as continuum and a part of the complexity of everyday practices

Understanding the ICT experiences and the digitally augmented city as a mesh of different temporal layers underscores the importance of continuations in this phenomenon [36]. The meanings of time are affected by the earlier experiences my interviewees have had with technologies, such as landlines and physical newspapers. For example, a socially highly active 68-year-old man was very reluctant to use the computer and the Internet; and in his interview he described how he had experienced the first computers slow and useless. In the business he used to work in, computers had also taken over some parts of the work processes. Many interviewees had learned to use a computer during their late working years, and had experienced it as extremely difficult and frustrating, which affected their current perceptions on digitalization. This was explained by belonging to a generation with a negative attitude toward ICT, according to, for example, a 71-year-old man who said: "most employees in our company were from the same generation, so most of them felt that it's [computer] useless." Though all interviewees either owned and used a computer or were seriously planning to buy one, they did not think it was irreplaceable; thus it would have been easy to give up.

Many described their everyday lives as busy, full of hobbies, taking care of grandchildren, household work and positions of trust in local societies' boards. Nevertheless, many experienced that their social networks and environments were shrinking due to their aging. Aging relatives and friends were passing away quite frequently; and this showed socio-materially in ICT when you had to erase contacts from your mobile phone book. Experiencing the inadequacy of the time left affects also the feeling of not wanting to waste time on things that are not considered important. The interviewees compared the time spent on a computer with for example painting or doing other handicrafts, cooking, or meeting people face to face. All these other ways of spending time were considered more valuable. For example, a 69-year-old woman, who was quite a skilled computer user, described strong feelings of anxiety if she spent "too much" time on her computer, and at that point she was forced to stop the interaction even though this meant that she could not finish what she was doing. The proximity of death meant also that the interviewees did not want to purchase expensive devices they might not be able to use for a long time.

For the interviewees the question of being able to live (independently) in their own homes was an essential part of aging, and they were all aiming to live on their own for as long as possible. Mobility, not technology, was a key to this, for them. Despite their age, they all described themselves as mobile urban inhabitants who consciously strive to stay that way. The fittest of them still did quite intensive sports, like aerobics and cross-country skiing, but also the ones with physical constraints continued to walk on a daily basis. They said that their aging bodies demanded this to keep on going, and to motivate themselves to move, they needed a reason, which usually was an errand to run [22]. All interviewees who lived in the city center stressed the easy access to all necessary services that was offered by this location, and which was assumed to be important in their future as well. For example, a 75-year-old woman who lived alone and suffered from serious back and lung problems, wondered about the ways welfare technologies could assist her to continue living independently. However, she was not ready to hand over her privacy and self-determination to computing technology:

> "Well, I heard that they have these experiments here where they have computers at home and surveillance so they can contact you. I don't know if it was the attraction of a novelty, but I thought that it could be a solution. But then I started thinking that it's going to be like Orwell's world then, and that doesn't sound appealing. So I would rather have a human being who would come here and ask me how I'm doing."

The design of a smart city could benefit from these understandings. For example, in order to be adopted, technology must not only be motivating and useful but it should, at least partially, have a positively experienced predecessor [62]. In the case of interactive touch screen displays, it could be a visual or a functional component that resembles something in the past that might fascinate people enough to start using the display. If designers were aware of previous negative experiences, they could consider how to overcome the barriers caused by these experiences. Since aging interviewees identified themselves as capable learners, and learning to use computers in more diverse ways was experienced very positively, this experience could also be utilized in future design. If aging adults are seen as truly potential users of public ubiquitous computing, the design would benefit greatly from including them in the process and offering participants positive experiences. Empowering aging citizens, among other citizens, is crucial when designing public technologies.

On the other hand, aging adults still construct strict boundaries both around the usage of computers, and between practices related to them in private and public spheres [22]. Computers are not a seamless part of their everyday practices. Instead, mobile phones have become such an important part of their lives that most aging citizens carry their phones with them everywhere; however, they are not eager to start using Internet services through their phones. This knowledge is essential when designing ubicomp technologies for everyone. The usage of (future) computing technologies must therefore be easy and quick, and the design must enable aging users to feel like they are in at least a semi-private place, although they are in public. The design should also consider aging dwellers' strong will to remain mobile and continue living independently

in their own homes. What kind of ubicomp design could enhance these non-negotiable parts of aging adults' lives?

6.2. Learning through reflexive ethnography

In anthropological studies, reflexivity is an essential part of ethnography which penetrates the whole research process [25]. In Participatory Design, the value of reflexivity has also been noted [63] and lately emphasized even more [64]. In ubicomp design this has not, so far, been the case. Instead, ethnography has been reduced to a "toolbox of methods" without reflective considerations on how the methods are used or how the material is analyzed, Dourish and Bell argue [17].

The aging interviewees expressed both worries for loosing track of the intensifying digitalization of society, and enthusiasm for the development of, for example, touch screen technologies. Especially men thought it was important to keep up with the development of technologies, and that this was a way to support the local industry. However, their occupational backgrounds explain this more convincingly than their gender: the strongest supporters of recent developments had either somehow indirectly contributed to the development of mobile phones in their working lives, or had worked in a field of business closely related to information technology. However, men without long personal history with ICT did not share this enthusiasm. Some of the women were the most skeptical about the strong emphasis on the high-tech industry and city's strategy, claiming that it did not have anything to do with their own lives and questioning the ideology of continuously innovating something new and revolutionary. Especially women who had their occupational background in nursing were worried about the possibility of robots replacing humans in hospitals. They said that no machine could ever completely replace human eyes and hands. Accordingly, for them, the decisive boundary between humans and machines was sensual, such as eyesight and touch. These kinds of thick descriptions entwined with temporalities explain why, for example, my interviewees construct these boundaries. They also show which boundaries are negotiable and which ones are too strict to cross, as aspect that could be useful to consider in designing technology for the elderly.

Aging is a lived, and in ethnographic study also a narrated experience produced in specific sociomaterial realities. Aging adults are not a homogenous group: scholars who have studied aging and the aged have noted that the eldest members of the society are, in fact, the most heterogeneous when we look at the age group. Consequently, age as a singular category cannot explain people's ICT relations. The versatile lifelong experiences differentiate most strongly the homogeneity in this age group [62,65]. Recent gerontechnological discussions have emphasized the importance of person-centered design and qualitative research by focusing on the actual experiences and practices of people, instead of designing on the basis of scientific knowledge on aging processes, for example. This ethos also challenges designers to consider aged adults as equal partners in design [66,12].

All aging interviewees argued that they were forced to learn computer skills to be competent members of the information society. This is the hegemonic discourse produced in the high-tech city of Oulu in recent decades, as well, which explains why the aging citizens were extremely worried how those elderly people who were unwilling and unable to learn these skills would survive in society. As long as ten years ago, Johanna Uotinen (2003) already claimed that computer literacy was a new meter of competent citizenship in Finland [44]. As noted by many scholars, in late-capitalist societies one's paid labor is an essential part of citizenship, social dignity and self-esteem [31]. Keeping busy and productive even after retirement is important because "wasting time" is not valued in these societies, nor by the aging citizens themselves [32]. The presumption of, for example, the designers of the ubiquitous smart city in Oulu that aging city dwellers would by default have more time to spend hanging around in the city center and using novel technologies [22] could be stigmatizing, and thus lead to a rejection of these technologies by the elderly [62].

The elderly citizens saw, nonetheless, the changes in technology mostly as being the "natural" state of affairs: societies must "develop" and one sign of this is the intensifying development of all sorts of technology. Still, some interviewees pondered about how long people can keep innovating something new. Their special concern was losing the offline human interaction; and they demanded that the benefits of progress should be more equally distributed, while the needs of different people should be more carefully considered. In addition to understanding the homogeneity of aging adults, the biographical interviews and their ethnographic analysis could benefit design by offering the awareness of the dynamics between socio-cultural discourses and structures and individual experiences on aging. The anthropological study produces analysis of the social and cultural contexts of individual experiences and perspectives; and importantly, the interviewees also offer their own contextual explanations of their experiences. Designers should realize that experiences not only depend on earlier socio-material encounters and social relations surrounding ICT usage, but also on the social discourses about the phenomenon of aging citizens and ICT [18]. This complexity should be addressed in and through the design; by both discussing the issue with the elderly and by encountering them as competent although different kinds of technology users [61,66]. The multiple ways my interviewees use computers show that there is a contradiction between practices and self-images. Additionally, the relation between online and offline could be openly discussed: does the designed novel technology affect offline interactions; and if so, how could design reinforce offline social relations, for example?

Since I had constructed the frame of the interviews as biographical it is no wonder that the interviewees talked a lot about their past experiences about, for example, communicating face to face, or through landlines and handwritten letters. My analysis of this material strengthens Suchman's notion that in socio-material relations also the past matters. Thus, the past is entangled in the intra-acting agents. Meanings are made both in boundary and reiterative practices; and I argue that this, together with strong negative discourses, has a significant effect on the seemingly unchangeable ICT relations of aging citizens. As a response to socio-cultural discourses, the aged perform their roles as dutiful citizens by blaming themselves and their age for their difficult and emotional encounters with ICT. On the other hand, they have learnt many computer skills and claim that

age is irrelevant; consequently, as a socio-material phenomenon ICT positions aging adults as old, though otherwise they might experience themselves quite young.

Catherine Degnen [30] has noticed that in their narratives, the elderly weave together more temporal layers, especially those of the present and the past, than younger people. Their narrative style is thus more circular; and they talk of themselves as if they were ageless, since they do not want to identify themselves as being old. Degnen argues that in Western societies old age has negative implications; and the aged are seen as people who look toward the past instead of the future. The future seems to be more valued in our societies than the past, which becomes visible, for example, in the discourses where the elderly and the aging demographic are considered problems which technological innovations could solve [43]. My ethnographic study challenges ubicomp and other technology design to take the past very seriously, and to utilize the knowledge about the past produced by aging adults and scholars. Understanding the past benefits the future.

7. Conclusion

Through presenting the ethnographic analysis of the biographical interviews dealing with aging citizens' ICT practices, and especially the ways they are constructed in socio-material encounters and temporal layers, this article shows how individuals are socio-cultural beings. The strong negative social discourses about aging citizens as incompetent and reluctant ICT users are clearly reflected in the narratives where aging interviewees describe their own ICT usage. However, simultaneously they talk about the multiple ways they use computers and the Internet, and how mobile phones have become a significant part of their everyday practices without changing their social networks. Further, I have discussed how the ethnographic study of aging adults' current ICT practices and their meanings could benefit the design of the smart city that has been designed and implemented in the city of Oulu, for example. Though ethnography does not offer straightforward bullet point lists of how to conduct design, I argue that understanding past experiences in relation to current ICT practices can be of great advantage in design. Comprehending technology usage as socio-material entanglements of the past, the present and the future, as well as of public and private spaces, is a good starting point for any design.

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