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"Realities behind ICT Dreams" Designing a Ubiquitous City in a Living Lab Environment

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ABSTRACT
The living lab methodology in technology design emphasizes user involvement throughout the innovation process. This article discusses the execution of this methodology in building a future ubiquitous city in northern Finland. We analyse how the sociomaterial practices of ICT design are constructed in thematic interviews with the designers. Three practices determining the realisation of the ubiquitous city were identified: Funding resources framing user involvement; keeping up the high-tech image of the city; and pursuit of scientific innovation. Then, following feminist technology studies, we discuss how power relations are negotiated, and how the user of new technology is constructed in the design process. In this particular living lab, users were configured as unidentified testers and consumers of the implemented technology rather than innovative co-creators. By reflecting on our position as female anthropologists we also illuminate the situatedness of scientific knowledge.

KEYWORDS
ICT design; ubiquitous technology; sociomaterial practices; living lab; situated knowledge

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INTRODUCTION

Designing a new technology is a complex process in which a wide range of identities, practices, discourses and relations encounter each other. Feminist technoscience studies (FTS) addresses this "messiness" through, for instance, understanding technologies as socio-material apparatuses configured in techno-scientific practices. The focus of interest in FTS is therefore on the "ongoing practices of assembly, demonstration, and performance" rather than on an invention as a singular incident (Suchman et al., 2002, p. 163). Karen Barad's work has been especially influential in comprehending reality as a flux of continuous entanglements of human and non-human agents. (Barad, 1997,2003, 2007; Suchman, 2002, 2007; Hekman, 2010; Sefyrin, 2010a&b.) In this paper we present an investigation into the design process of a ubiquitous city (where ICT is embedded into the infrastructure of the city) located in Oulu in northern Finland. We discuss the ongoing design of a new technology as constituted by different socio-material practices, as well as the consequences these practices have, in particular, on configuring the user of this technologized city. As Suchman, Trigg and Blomberg (2002, 164) argue: "technologies-in-the-making afford an opportunity to investigate the imaginative and practical activities through which sociomaterial relations are reproduced and transformed".

Ubiquitous Oulu is a prototype of a future ubiquitous city which is designed and built by the multidisciplinary UrBan Interactions Program (UBI Program). The program is based on a research agenda of computer scientists working at the Department of Electrical and Information Engineering at the University of Oulu. However, its execution has been crucially dependent on many partners, especially on the city of Oulu. Other important partners are, for example, the funders and representatives of industry, such as Nokia. Academic partners come, for instance, from the disciplines of architecture, marketing, industrial design and, lately, cultural anthropology[1]. The official aim of the UBI Program is to create "an urban environment in which better services are being offered to the people of the city" (UBIOulu, 2011). The presence of new ubiquitous ICT technologies is meant to create new ways for people to interact with each other and with different devices as well as with public organizations. These targets are pursued by implementing new technology in the city centre: large interactive touch screen displays, Bluetooth and sensor networks, as well as an open and free wireless network called "panOulu" have already been installed.

Our intention in this article is to analyse the design process of ubiquitous Oulu as it is performed in the thematic interviews we carried out with twelve people who participated in decision making within the program. The interviewees represent different stakeholders who have been involved in the UBI Program at different stages: from the rough early plans to the later decisions concerning for example the

location of the displays, or the services designed for the citizens. In their accounts of the design process, the interviewees not only constructed their position as representatives of their institutions but also in relation to each other and to the potential users of the new technology.

Our central interest in this article is to identify, on the basis of the interviews, the main *sociomaterial practices* which constitute the design process of the ubiquitous city in Oulu. Funding and business practices as well as previous and current discourses surrounding technologies and innovations are examples of the "hybrids" of social and material arrangements and conditions that enable and restrict the realization of the technological plans (cf. Sefyrin, 2010b, p. 117). In Barad's terminology these can also be called *apparatuses* (Barad, 1999). The designer positions are disclosed in the intra-action with other positions, entities and discourses thus creating together the sociomaterial reality of this particular design process. We argue that discourses are an essential part of intra-actions, but we understand the *discourse* in a similar way to Barad, that is "not what is said; it is that which constrains and enables what can be said." (2003, p. 819).

The designers we interviewed defined *the living lab* methodology as an important starting point of the UBI Program. Ideally, the concept refers to an approach where user involvement is considered crucial for a new innovation to succeed (Thiesen Withereik & al., 2009). In this paper we analyze how the living lab methodology has been executed in the UBI Program within three main sociomaterial practices which, according to our interpretation, emerge in the encounters of this particular design process: *the funding resources framing the user involvement; keeping up the high-tech image of the city*; and *pursuit of scientific innovation*. This reality has been reproduced through discursive and material practices through the years in the city of Oulu where several agents have purposefully striven for building a technologically progressive city. The interviews themselves were also one arena where the reality of UBI Oulu was discursively and socially (re)constructed. Of particular interest here is how the potential user of the new technology is implicitly and explicitly constructed in the intra-actions of the design process. Finally, we discuss how the design process is gendered; what kind of gender performances are implicitly embedded in these three practices despite the fact that the designers might believe in designing a gender neutral technology.

METHODS AND MATERIAL

During the summer and autumn of 2010, we conducted twelve thematic semi-structured interviews – and gained insight into twelve diverse perceptions of the ubiquitous city of Oulu. The purpose of these interviews was to illuminate the background and the goals of the UBI Program and how they had been achieved so far. The length of the interviews varied from one hour to two and half hours and all, except one, were conducted by two interviewers. Since we were part of the UBI Program, all interviewees reacted to our request to interview them positively. Four of them represented the University of Oulu; three were working in the public sector for the City of Oulu; two had changed their employee from the city to a technology-

related organization; one was working in the private sector linked to the city; one represented the industry and one the financiers. Thus, all central stakeholders of the program were represented. The interviewees varied in age from 29 to 61, and ten had a technology-related higher educational background. In order to respect the interviewees' anonymity we only introduce them briefly.

In this article, we call all interviewees 'the designers'. Although not all of them had participated in the actual designing tasks of the applications or the technology, they had been involved in the broader design process by making funding decisions or construction plans, and by engaging actively in discussions and meetings. Only two of the interviewees were women; moreover, it is also worth noting that all members of the academic research group focusing on ubiquitous and urban computing were men. This reflects the gendered tradition of the Finnish ICT research and business as male-dominated spheres and arenas where culturally defined masculinity is linked with technology (cf. Vehviläinen, 1997, 2005). In this article we look at gender both as a discursive and a material practice performed in the design as well as in the interviews.

While analyzing the interviews we realized that the representatives of the university and the representatives of the city formed two distinct groups. We also perceive the interviewees who had formerly worked for the city and the one working in the private sector related to the city as part of the latter group. They were for example collectively emphasizing the importance of the functional city centre with easy-to-use services and they did not stress the scientific innovation as strongly as the representatives of the University. The means of using power in the UBI Program were also different among these two groups: they performed their own accountability differently (see Sefyrin, 2010a). The program had been executed in line with the triple-helix[2] strategy and all stakeholders had been able to comment on its implementation in the steering group meetings. Nevertheless, while analyzing the interviews it became clear to us that the final decisions were made by the representatives of the University, the experts of hardcore technological knowledge.

When reading the interviews we used content analysis (e.g. Miles & Huberman, 1994) as a methodological tool. We understand that interviewing produces reality discursively but that it also relates to material facts. This approach can be called *critical realism*; and according to the anthropologist Charlotte Davies, "while interviews cannot be taken as a straightforward reflection of the level of the social – – there is a connection, an interdependency between the two levels that allows interviewing to provide access to the social world beyond the individual" (1999, 98). For example, in the case of the UBI Program certain economic resources exist prior to language; and by using language we can reflect these sociomaterial realities. At the same time language is reproducing the conditions within which things come into being.

During the first reading we aimed to identify the main categories related to the question of "who is the ubiquitous Oulu designed for". During the second reading we paid more attention to the details of how the interviewees explained their approaches, motives and acts in the design process. Hence, we have reconstructed

the sociomaterial practices from the interviews through repetitive readings; and these formulations were directed by the notion that the designs are always made in social settings which are shaped by their own institutional and individual histories and practices (Markussen, 1996, p. 136; Mackay et al., 2000). The speech of the interviewees is seen as a performative act where discourses and material entities, for example interviewees as embodied, gendered beings and financial resources, intra-act. Discursive and material natures of the practices are conjoined (Barad 2003, 823): for example, it is important to have financial resources to be able to build a large research consortium. In the intra-actions the pre-existing meanings of funding are reproduced and transformed.

Finally, we have drawn on the perspective of *situated knowledge*. We follow Donna Haraway's footsteps in understanding the nature of knowledge as partial, and jointly produced by the interviewees and interviewers in their individual and shared social surroundings. Thus, a researcher cannot be an objective observer, since every gaze of a subjective agent both includes and excludes things. Objectivity in feminist research means acknowledging the partiality and imperfection of the perspective we are looking from. (Haraway, 1991, p. 186–198. See also Landström, 2007; Lohan, 2000.) Christina Björkman, a specialist in feminist computer science, calls this approach "conscious epistemological positioning", which in turn can be described as "actively taking a stand" (2003, p. 158). How are we positioned in relation to the interviews we are reading? Our position is framed by our training as cultural anthropologists and thus specialists in qualitative research. We are women doing gender studies in a male dominated ICT sector where quantitative methods prevail. Therefore, it is crucial to discuss our own agential accountability and the consequences of our own boundary construction.

LIVING LAB AS A STARTING POINT

The whole concept of a living lab embraces multiple approaches and implementation methods, but in recent discussions the role of the users has been further highlighted and the importance of a more participative approach has been emphasized (Eriksson et al., 2005; Fölstad, 2008). This means that users should be perceived as co-designers and active agents throughout the whole innovation process instead of being merely objects of research. Thus, ideally users should become the fourth strand of the conventional triple-helix model in addition to the public sector, research organizations, and companies. (Schumacher & Feurstein, 2007; Mulvenna et al., 2009.) In an ideal situation the living lab has an equalizing tendency since its aim is to consider seriously the users' opinions, experiences, and skills.

The concrete infrastructure of the living lab of UBI Oulu consists of invisible wireless networks as well as highly visible, large public displays for both indoor and outdoor use (Figure 1). The displays comprise a 57" landscape LCD panel with full HD resolution. They are equipped with a set of additional hardware components, for example a camera and a set of loudspeakers, though the speakers were not in use at the time of the interviews. Consequently, the interviewees emphasized the visual

capacity of the large touch screen displays. Otherwise the displays are designed to look quite businesslike and not very playful: they are dark grey rectangles with sharp edges that match the already existing street furniture in downtown Oulu. When the display is not in use, it shows advertisements and announcements by the city. The displays are more or less permanent, strictly located installations; whereas networks, for instance WLAN, highlight dislocated actions and enable for example working or studying while sitting in a cafe or a restaurant. At the time of the interviews the most visible part of the novel ubiquitous technology, the displays, had been in use for just over a year. Their interactive services offered for example news, information about local restaurants, events and public transport and a Google maps-based service. In addition, the services included photo applications, games and commercial pages. (UBIOulu, 2011.) Since the implementation was divided into pilot phases introduced in the summers of 2009–2011, the applications were constantly under development. The future plans for the ubiquitous city included, for instance, projectors that reflect moving images on the wall of the city theatre and ubiquitous lighting that reacts to its surroundings.

Figure 1: An outdoor public display (UBIOulu, 2011).

All our interviewees were familiar with the living lab concept, except the one who had only participated in the hardware design. They stated that this methodology was a valuable and interesting premise for the UBI Program, and emphasized how important it was to get out of the traditional laboratory and conduct research among “ordinary citizens”. The significance of “the real environment” and “the real users” was mentioned by several interviewees. The fact that the new ubiquitous technology had been installed on a large scale into the city centre where people can freely use it was seen as a great achievement; and the living lab’s capability to reveal the multiple challenges related to new urban ICT was considered valuable.

The aim of involving the users *throughout* the innovation process, however, seemed to be the greatest challenge of the living lab. The computer scientists had detected the city dwellers' views beforehand by conducting observation, in-situ interviews, and a mock-up study with low-tech devices during two days. The information needs of passers-by gathered by this "rapid ethnography" were utilized when creating digital services for the citizens. At the time of conducting the interviews some surveys had also been done, however the main user feedback consisted of quantitative data collected automatically by the displays including the temporal and spatial information on the usage of the applications. This reveals for example which services are launched within each session. However, methods like this frequently used in ICT research are not sufficient if the aim is to take into account the everyday lives of people (Eriksson & al. 2005). To benefit fully from the living lab methodology the background of different users should be thoroughly studied in order to understand their perspectives on the new technology.

In practice, the conditions for user participation are often seen as limited (Thiesen Withereik & al., 2009; Fölstad, 2008), and the users are seen more as experimenters with existing technology rather than co-creators (Niitamo & al., 2006). This was evident in our material, too: the interviewees talked mostly of the users in UBI Oulu as *testers* of the new, already implemented technology, and not as innovators or co-designers. Those who were more familiar with the concept agreed that involving the users earlier could offer the designers new ideas, but some of them also questioned whether the users could actually articulate their needs before the implementation. For the representatives of the University the living lab was a self-evident starting point that was extensively used in their disciplines. Nevertheless only one of them stressed the significance of involving users throughout the whole innovation process. He also saw this as one of the biggest challenges in UBI Program. Overall, many interviewees agreed that considering the needs and interests of different kinds of users was important and it had not received enough attention. One representative of the University described the living lab of UBI Oulu as "non-controlled" in a sense that the researchers had not conducted studies to identify users, but agreed that they should carry out focus group studies in the future. In this sense the living lab of Oulu can be described as a technology driven test bed for new infrastructure and applications (cf. Thiesen Withereik et al., 2009; Fölstad, 2008).

Opinions varied about how well the pre-existing form of the living lab had succeeded. Some saw the execution as a success while others doubted that the researchers had completely understood the complexity of this kind of rehearsal. It was considered as a move in the right direction, but realised, so far, too narrowly. In particular, the representatives of the city were sceptical about the way the living lab had been executed in the program. They saw themselves as responsible for making the city a more interesting and functional place for all citizens, and one of them underlined this position by criticising the lack of user studies. He also criticized the implemented services and the technical problems the program had faced by contrasting the practices performed both by the University and city representatives with the business world.

> I've been thinking a lot that if a commercial producer had constructed it, they couldn't have afforded to blow it. But when the University or municipality is doing this kind of rehearsals, too many incidents occur […] Everything should be polished and considered thoroughly, and you shouldn't rehearse with them. The rehearsals should be done in the laboratories and like, where you finally come up with the end-product. […] Then the consumer will gain a happy user experience. (Representative of the city.)

The diverse fields of participatory design (PD) and computer supported cooperative work (CSCW) offer alternative ways of involving the users in the design process. PD refers to a set of theories and studies developed especially in the Scandinavian tradition where users of the technology are seen as co-innovators and multiplicity is taken as a starting point. Since its foundation in the 1980s its aim has been to involve users in design projects by using collaborative methods and also to democratize the design (e.g. Bjerknes et al., 1987; Bjerknes & Bratteteig, 1995; Elovaara & al., 2006; Marti & Bannon, 2009; Tollmar, 2004). CSCW is a design-oriented multidisciplinary field which focuses on how to design adequate computer technology in order to support human collaboration and enable interaction between people (Tollmar, 2001). Ethnographic methods have been used in both fields (e.g. Hughes & al., 1992; Elovaara & al., 2006). Thus, another kind of sociomaterial reality was available for the designers of the UBI Program. In the following we discuss what kind of intra-actions led them to exclude the identified users almost completely from the design.

FUNDING RESOURCES FRAMING THE USER INVOLVEMENT

Lack of financial resources was the first reason that the interviewees mentioned for the failure to better involve users. In the beginning, the UBI Program received EU-funding for the technological infrastructure but not for the content production. The interviewees stated that this led to a consensual decision proposed by computer scientists to start the program with technological design and hardware installation. The representatives of the University explained both this decision and the urgency to construct something visible by the pressures to gain further funding. They wanted to be able to show that they had managed to build novel technology in a real urban environment and thought this was crucial for the survival of the program. Therefore, the computer scientists talked of funding practices as something that they must adapt to, not something they could really affect by their own ideas and choices. The designers argued that they had been forced to renegotiate the goals and the resources of the project.

> You should go through the funding applications, what was applied for, and what was gained. […] How the goal setting has changed, how the resources have changed. And are the changed results of the project dependent on the project manager or not? The results that don't go

> together with the original wet dream, that we'll do it like that. (Ex-representative of the city.)

Despite the large amount of statistical data gathered, it did not reveal who was using particular services and what kind of technological solutions would be most beneficial for different user groups. Referring to the user data collected through the rapid ethnography, the needs and thoughts of the participants were described by the interviewed computer scientists as "traditional" offering no surprising ideas for them. Thus, the focus had mainly been on the user-centered design, not on the PD following the Scandinavian tradition (e.g. Bjerknes et al., 1987; Elovaara et. al, 2006; Karasti 2003). One recent example of a more participative approach mentioned by the computer scientists was UBI Challenge, a competition aimed at "anyone" to come up with a new application that would be implemented in the display. However, the entrants had to be able to produce the application themselves, and consequently, it is difficult to imagine that people without any knowledge of the software design could participate.

Rather than identifying and serving different users, the current living lab of ubiquitous Oulu is determined to offer "all services for everybody", as one of the computer scientists described it. Likewise, other interviewees thought that the UBI Oulu was designed for *everybody*. In particular, some representatives of the University described the user as "anybody who moves in the centre"; whereas more business oriented interviewees called them "the customer" or "the consumer". Otherwise, the imagined user did not seem to have any specific qualities – except the ability to move around in the city centre, and implicitly, the ability to consume. We conclude that this undefined user is a result of a lack of the kind of user studies where users are considered more heterogeneously. The configuration of user as everybody is, anyhow, misleading. The design process of technology includes the construction of user representations; thus, technology is always aimed at *someone*, and this user hypothesis is embedded into the technology (Oudshoorn et al., 2004, p. 41).

The boundaries of the sociomaterial reality of the living lab in ubiquitous Oulu were performed by including the quick implementation of technological infrastructure and by excluding the users from the innovation process. When for instance gender as a matter of reality is excluded from the design, the innovated and implemented technology is considered to be gender neutral. However, feminist technoscience studies have pointed out how the social world, including gender relations, affects technological innovation since the design is performed in this world (Wajcman, 2009). Thus, the exclusion of gender from the design process has consequences which materialize for example in technological devices and applications.

While analyzing the interviews we noted how our own perception of the living lab was tightly connected to the possibilities for users to affect the design process. At the time of constructing our framework for these interviews, we were not that familiar with different kinds of living lab definitions. We wanted to know whether the designers had identified different kinds of user groups and their diverse ICT capabilities and needs. For us, the significant factors to be taken into account in a

living lab are the gender, age and social class of users and their individual experiences of ICT. The fact that the quantitative data collected by computer scientists did not reveal these social factors means, for us, that they were faded out. Since then we have also learnt how innovations can be created from scratch with the users. This means that, ethnographic methods can be utilized not only while studying the domestication of technology but also before the design process actually starts (see e.g. Limonard & de Koning, 2010; Thiesen Withereik & al., 2009).

KEEPING UP THE HIGH-TECH IMAGE OF THE CITY

During the recent decades the industry and the image of Oulu has been built on high technology and the success of Nokia has been its most visible symbol. According to the regional geographer Topi-Antti Äikäs, who has studied the construction of Oulu's city image, this strategy was politically motivated and already implemented at the beginning of the 1980s by establishing a "technology village" close to the University. The city wanted to detach itself from its former reliance on forest industry and to create something new and exceptional; and so it declared itself to be a city of technology in 1984. (Äikäs, 2001, p. 197–208.) This strategy has been successful and nowadays Oulu's economy is strongly based on information and communication technology. For example, in 2009 Nokia and Nokia-Siemens Networks together were the third biggest employer in the city (City of Oulu, 2010).

In our analysis we noted that keeping up the high-tech image of Oulu was performed in the interviews as an important sociomaterial practice. The interviewees stated that it was one of the main reasons they themselves and the institutions they represented wanted to participate in the UBI Program. They all shared a concern that Oulu was "left behind" in technological innovaton or that it was "frightfully silent" in the field. Many reminisced about the "good old days" when Oulu was one of the world leaders especially in mobile phone research and industry. They thought that the UBI Program ensured that the city was at least still moving on, and one ex-representative of the city based this argument on the saying that "a rolling stone gathers no moss". The *movement forward*, the *high speed*, and the *value of novelty* were recurrent discourses in the interviews when discussing the relationship of Oulu and ICT.

Most of the interviewees had earlier participated in the execution of the local triple-helix strategy and argued that the success of high-tech Oulu was based on the well-functioning and close personal relationships between the University researchers and the representatives of the industry and the city. During the planning of the UBI Program these pre-existing relationships were utilized when putting together a new consortium. Since the results of the previous high-tech enterprises had been successful, interviewees wanted to join this program as well. It became clear in the interviews that the "high-tech city" discourse had gained a hegemonic status; it was seen as an unquestionable matter of fact. Even the one interviewee who questioned the city's strong reliance on ICT worried that the "imperfectly" working

displays and their potentially useless services could actually harm the positive high-tech image of the city.

The discourse of high-tech Oulu represents, at least partially, the idea of *technological determinism*. The term refers to an ideology where "science and technology induce progress autonomously", as anthropologists Arturo Escobar (1994, p. 211–212) writes, and technology is actually considered "the arrow of progress". According to Jan Cherlet (2011, 3), a specialist in science and technology studies (STS), the extreme forms of the ideology can be divided into two different ideas that complement each other: the first idea is the previously mentioned autonomy of technology, the second is the conception that the arrival of new technology inevitably has an impact on society – and that technology even determines social change. For example one of our interviewees took this second perspective.

> It's like a wave, which just moves on, and it is doomed to happen**.** If we think about this kind of technology, it just moves on, and if we, here, just stand still, and then fall down, it still goes on, the progress. And from this point of view I'm hoping that the city of Oulu and the business life more widely and other actors would understand that now is the time to catch this, that not even in Helsinki do they have this kind of system. We should kind of hype this. (Representative of the University.)

Another of the representatives of the city claimed that there always has to be a special group of people who give the first push and ensure that society keeps developing. In the context of high-tech Oulu, this group is the ICT-designers. The strong gender division of labour in the Finnish ICT sector has material consequences: the innovators and the designers are mostly men. (e.g. Vehviläinen, 1997; 2005.) Thus women are excluded from the group of innovative people developing society. Another interviewee stated that everybody has the need for ubiquitous technology but only some are keen to develop it.

The interviewees also anticipated that the new technology would affect human behaviour and societies: the ubiquitous technology could offer a new channel for people to interact with each other. UBI displays could for instance encourage citizens to interact more directly with the city officials, and they were also supposed to improve users' experiences of their stay in the city centre by offering them new ways to experience art, for example. The interviewees saw the displays as part of people's everyday ICT-behaviour in the future, especially if the applications were more tightly connected to mobile phones. Users could for example upload and download information to and from their phones; and the display would recognise the users and offer personal services for them.

On the other hand, discourses of *technological voluntarism* were also used. In contrast to technological determinism, technological voluntarism represents an ideology where individuals as well as institutions and societies are believed to be in control of technology and able to make it work as they want (van Dijk, 2010, p. 8–9). Some interviewees described the technology implemented in the city centre as

"enabling". They emphasized how people can invent new ways of using it, and how the designers cannot know what the citizens will do with it. These interviewees admitted that the living lab environment built by the UBI Program can also prove this technology useless.

We argue that due to the high-tech image of Oulu, its citizens were expected to be comparatively competent users of and interested in new technology. Since the panOulu network, for example, had been intensely used, the designers anticipated that the displays would be utilized just as much. Though the appropriation of new technology can be studied before its implementation by involving the users in the innovation process, the designers of UBI Oulu decided to wait for the citizens to start using the displays. The imagined users were thus willing and able to use the technology designed for them, and this is why the interviewees considered the city centre of Oulu an ideal place to build such an extensive living lab. The designers strongly reproduced the sociomaterial reality of Oulu as a place where technological innovation is appreciated and the triple-helix strategy in the ICT sector functions well. Undoubtedly, this discourse is used to legitimize the practice of using the town as a "playground" for ICT professionals. Who is willing to play with the designers is another question.

PURSUIT OF SCIENTIFIC INNOVATION

> As a researcher I'd naturally like to have the kind of services that are technologically new and interesting, which would then enable [us] to make good publications. But generally, if you put technological novelties there, people either don't know how to use it, or they don't have suitable DTEs to use it, or they just aren't interested and so on. (Representative of the University.)

Despite acting as a reminder of Oulu's reputation as a progressive high-tech city, the representatives of the University criticized the research environment in the city centre living lab for not allowing them enough freedom to test the new technology. They considered the city centre of Oulu too small and the atmosphere restrained. Thus, the real user offered by this particular living lab was not necessarily the *ideal user*, who was described as open-minded towards new technology and accustomed to it. The representatives of the University had decided to solve this problem by installing lighter displays at the University campus, where the atmosphere – referring probably also to the users – was described as being more experimental and permissive.

> We could bring, well, very exotic interaction models, let's say there, HCI, human-UBI Hotspot interface, but how they would break through, what kind of impact they'd have, how they would be used, it's impossible to say, I don't have a crystal ball. But now we are going to, can perhaps pursue let's say freedom in this case, we got funding for bringing 12 lightweight UBI-hotspots [displays] here at the University campus, where we probably dare to make some more courageous solutions, because

> here the environment is maybe more permissive, experimental, and we don't have the same, let's say constraint, that we have to accept in the centre of Oulu. It is again this gap between the world of research and the real world. (Representative of the University.)

In practice, the innovativeness of technology and the aim to offer the services for "everybody" can easily be seen as competing interests, and occasionally, the democratic goal has to give place to the technological race (e.g. Oudshoorn et al., 2004). In our interviews, the discourses concerning innovation and the idea of the "user as everybody" are in contradiction. On the one hand, the interviewees emphasized how the ubiquitous technology implemented in the city should benefit the citizens by making their everyday life easier and by giving them new possibilities for interaction. On the other hand, the computer scientists were conducting their scientific studies and they argued that technological innovation was crucial if they wanted to succeed in their own field. The researchers expressed that they had to "restrain" themselves to some extent in this kind of living lab study. Conducting their study in the city centre of Oulu places them in between the demands of the "real world" and the scientific world.

Innovation and designing user-friendly applications do not have to be mutually exclusive, but the design process of the UBI Program led it towards the so called *I-methodology.* This refers to implicit user representation techniques where designers often unconsciously "consider themselves as representative of the users". (Oudshoorn et al., 2004, p. 41–44; Akrich, 1995) . Accordingly, technologically highly competent (male) designers may expect lay people to share their interests and abilities, and are consequently designing for themselves, or for people resembling them. This way the idea of designing for everybody can diminish. Since no studies tracing the users' everyday lives or social and cultural aspects of the ICT usage had been conducted, we argue that the designers of UBI Program had relied heavily on the I-methodology. In other words, they had based their decisions on their own experiences and expectations. This means that the imagined user is *a reflection of the designers*: a young male computer expert. Though interviewees emphasized how the UBI displays were not designed just for the "geeks", they expected the users to share their own attraction to the new technology and definition of the easiness to use the displays. So for example, an interviewee outside the ICT, instead, claimed that the interface was not easy enough for everyone. He said that he had actually asked the computer scientists to insert simple instructions on the displays, but they had not done it. Presumably, they had relied on their own capabilities as the standard. Many ideas for the applications of UBI displays came also from the researchers themselves. In our interviews, most representatives of the city referred to this by claiming that entertainment and games had been given too much space. This kind of emphasis can, of course, predefine the user groups with an additional effect on the gendered usage of the displays.

Nevertheless, innovation itself can be conceptualized in various ways. We can ask what counts as an innovation – how novel a device, an application, or the way they are used, has to be in order to be considered innovative? (Haddon, 2010, p. 54–

66). Suchman (2002, p. 100) argues that technology design practices often emphasize innovation "as the rejection of things past" which leads to its mythologization. She writes that "[i]f current practices using existing technologies are assumed to be stagnant until the professional designer appears on the scene, the designer's ignorance becomes his or her credential" (ibid.). It seems for us that in the discipline of computer science, the hegemonic discourse concerning innovation builds on this kind of thinking. In other words, innovation is mythologized to the point where only something "radically new" counts as innovation. The innovation could, however, be understood as something that always builds on existing forms of social and material practices. (Suchman, 2002.)

The computer scientists formed the core of the design and made the final decisions concerning the execution of the living lab, thus their conception of what counts as innovation was a determining factor. This sociomaterial practice of a competitive ICT sector, which encourages the creation of innovations as quickly as possible, is in clear contradiction with the time consuming living lab methodology (Oudshoorn et al., 2004, p. 31). The ordinary users seem to vanish in the context of the technological innovation process, where the most significant aim is to create novel innovations appreciated by other computer scientists. This also keeps the gender boundaries of the design process unchangeable. However, due to the dynamic nature of the sociomaterial practices and the constantly moving boundaries of the constructed reality, the innovativeness of computer science may in the future have to give room to more participatory research, in which the users are well defined and involved in the process. This way, an innovation would be considered more in terms of the social values it produces rather than through the mythologization of technological innovation.

THE IMAGINED USERS

Interviewees emphasized that anyone is free to use the services of the ubiquitous city but, at the same time, they presumed that certain age groups would use them more than others. Almost everybody mentioned young people as the most probable active users and argued that children, teenagers, and young adults are open-minded, courageous and laid-back enough to use new high-tech devices. They may also find time-consuming games and entertainment fascinating in contrast to busy adults. Instead, shyness, fear of failure, prejudice against new technology, and the lack of technological competence were mentioned as the qualities that can prevent people from using the public displays in particular. Nevertheless, some interviewees also pondered that although the general opinion stresses that adolescents are the early adopters, this is not necessarily the whole truth. Elderly people, women and men over 60, were also mentioned as potential users, mainly because they were not supposed to be busy. However, some interviewees questioned their skills to use the new technology and commented that in order to interact with the displays one has to be familiar with touch screen technology in particular.

"Path-dependency", that is, where "new" innovation is built upon the earlier ones, affects user configuration (Oudshoorn et al., 2004, p. 52–53). This could be noticed

also in our case because the previous studies about teenagers as the early adopters of new technologies had influenced the user configuration of the UBI designers. To get these people interested, the innovation must somehow be designed specifically for them. As a material consequence of this user configuration, there are plenty of entertainment applications such as games in the UBI displays. It was also notable that the interviewees talked about teenagers and older people as homogenous groups without considering gender or other social differences, though gendered words like “grandpa” and “grandma” were used. Some mentioned the capabilities and attitudes of their own elderly parents, for example, by recalling how they had decided not to learn how to use computers. The ideal user was someone who was not exactly an ICT expert, but neither were they someone without good technological skills. Age becomes a significant boundary constituting the reality of the local living lab as a space where teenagers as early adopters and older people as unhurried citizens occupy the ubiquitous city. Here, again, gender was not discussed as a relevant factor. Nevertheless we argue that it is enacted in the intra-action of the missing qualitative user studies and I-methodology for which the designers are accountable.

Gender unfolds in the design process of new technology where the boundaries between the included and excluded entities are performed. The entanglements of the non-human agents, such as technology, and the human agents also reproduce and transform gendered meanings and experiences. (Harvey, 2011; Sefyrin, 2010b; Landström, 2007.) The gendered discursive and material practices of Finnish society are reproduced in the sociomaterial practices of the design process discussed in this article. In Finland, the widely shared idea that gender equality already exists, means that gender issues are often dismissed and ignored (see Heiskanen & Rantalaiho, 1997). Consequently, for instance technology is considered as gender neutral. This idea of neutrality is also enacted in the intra-action of designing UBI Oulu. The materiality of new technologies in this city is however not neutral: for example, the height of the interactive screens suit better average-sized men than women, and the urban space where the infrastructure is situated cannot be considered as a gender-, or age-, neutral place, at least not in the anthropological sense. Thus the material conditions are significant in constructing the meanings of gendered user experiences (see Harvey, 2011, p. 177).

Since the everyday life of city dwellers is already inhabited by phones and other mobile devices, we asked what the niche of the UBI display is in people’s information network. Most of the interviewees had a clear vision of this: in an ideal situation the display would be more context-aware. The citizens could use profiled services and content produced by the companies and shops nearby. The visual capacity of the displays differentiates them for instance from smartphones, and some of the interviewees suggested this feature could be utilized more. In these dreams about ideal usage the user’s role was mainly to be the consumer, but also the user’s active role as a citizen was emphasized by some interviewees. One representative of the city assumed that the users could give feedback to the designers either through the display, or via the internet. Thus, the users should themselves become active in participating in the design process. Social features

such as playing games or exploiting social media as a probable use were mentioned especially by the computer scientists.

Suchman (2007, p. 278–279) reminds us that design is a dynamic process which continues after the implementation of technology. The separation between the "designer" and "user" constructs these categories as stable but, according to Suchman, they are overlapping and constantly changing. Thus the design should not be seen as an exclusive practice of professionals. Our interviewees also thought that, in the ubiquitous city of Oulu, the users continue to design the installed technology by appropriating it to their own needs. Still, they also constructed clear boundaries between the ICT professionals and the ordinary users; and even between the technology enthusiasts and "lay people", who are not that interested in using and buying the latest technological innovations.

Michael J. Muller (2003) claims that the problem with the design methods of Human–Computer Interaction (HCI) – used also in the UBI Program – is that they do not really bridge the world of software professionals and the world of end-users. Both worlds have their own body of knowledge and practices, as well as well-defined boundaries. He also criticizes traditional HCI methods for being one-directional: they usually do not involve a two-way discussion. Muller proposes that the methods of PD could offer a "third space", where professionals and users could meet and *mutual learning* could take place. (Muller, 2003, p. 1054; see also Verhoeven & van Gemert-Pijnen 2010, p. 120.) Mutual learning is a central concept to PD. It refers to how users need the knowledge about the possibilities given by technology and at the same time designers need to know the (work) practices related to technology. If these premises are not fulfilled, it is difficult to create something that will meet the requirements of the actual usage (Sefyrin 2010a, p. 68). If ideas from PD were integrated into the dreams and practices concerning the ubiquitous city of Oulu, the rather shallow vision of users could turn into the richness and diversity of the real users. The sociomaterial practices of the design that we have presented here are mostly defining the users as outsiders. However, due to the dynamic nature of these practices, they could also come into being differently.

CONCLUSION

In this article we have aimed to identify the main sociomaterial practices that constitute the reality of designing a ubiquitous technology for the city of Oulu. In particular, we have considered how *the living lab* methodology was carried out in installing the technology in the city and how the potential user of the new technology was constructed in the design process. Theoretically, our discussion is linked to FTS, which emphasizes the importance of investigating the encounters between discursive, social and material agents in technological design. Therefore, our aim has been to situate the performances of the human and non-human agents of the design process from the conducted interviews and ask what material, in this case technological, consequences and social power hierarchies the intra-actions between different agents produce. Simultaneously, we see that the material and

social practices we have identified have their roots in the earlier practices, but during the process, as well as in the interviews and in our analysis, the shared sociocultural meanings of technological design are reproduced and reorganized. Three sociomaterial practices constituting the design process were identified from our interview material: *the funding resources framing the user involvement; keeping up the high-tech image of the city*; and *pursuit of scientific innovation*. All of them could be seen as following certain historically formed practices in certain arenas, such as co-operation between key actors in building the technological infrastructure and business opportunities in Oulu and the scientific community of computer engineers. For example, it was obvious that the interviewees' conceptions of the order between money and innovation in the process were different. Representatives of the University thought that they were forced to plan and build the first UBI displays to assure the financiers of their innovativeness. In this situation, the timetable was estimated as too strict to allow thorough user studies to be carried out. Instead, the representatives of the city and business saw the implementation of the displays as a somewhat precipitate project which should have been planned more carefully.

In our analysis the configured user of the ubiquitous Oulu became visible both explicitly and implicitly. Explicitly the user has two dimensions: s/he was described as *everybody*, as a willing and able tester of the implemented technology. On the other hand, the imagined *potential or ideal user* was a technologically competent child or teenager who was not afraid to use ICT in public spaces. Through the construction of sociomaterial practices several implicitly produced user images were unfolded: the unidentified occupant in the city centre, the technologically enthusiastic citizen, and the reflection of a young male computer scientist. Though the premise of designing for everybody is an egalitarian aim, it seems to be an illusion.

The sociomaterial realities of the ICT dreams are agentic; and so are our own scientific practices, methods and theories (cf. Hekman, 2010, p. 105–107; Haraway, 1991). As anthropologists, we are, for instance, used to relying on qualitative data and, therefore, understanding the value and the usability of quantitative data might be difficult. For us, the identification of the users, analysing their personal backgrounds and the context of their technology usage is crucial. Thus, we understand them more holistically than merely as users. In our analyses we have participated in the construction of another sociomaterial reality for the design process of UBI Oulu. Through our analysis we have stressed the agency of the above mentioned practices and user images not only by the methods and material we have used, the questions we have asked and the readings we have practiced, but also by our own subject positions as feminist anthropologists.

In the compounded sociomaterial reality the computer scientists are in a strong powerful position: they are both behind the original ideas and the execution of the plans. This power position is illustrated both by the computer scientists themselves and other interviewees: they construct their speech either to legitimise or to question this order. The presented sociomaterial practices are biased towards technology and computer science, which also affects the user configuration. On the

other hand, the power relations between nonhuman and human agents should also be discussed. The interviewees pictured themselves as acting in the frames of material boundaries, such as the funding, but they also talked of themselves as active agents in the decision making. We argue that the entanglements in technology design should be discussed not only as intra-actions of different entities, but also as apparatuses with their historical backgrounds and social contexts. There is always a dreamer behind the dreams, and not all agents have equal chances to make their dreams come true.

ENDNOTES

[1] Our anthropological project is called *UBI Anthropos*, in which we are studying the new ubiquitous technology as a part of everyday life in northern urban surroundings. The first steps include contextualizing the new technology, for example by exploring its development processes. The project had started a couple of months prior to the interviews with the designers.

[2] Triple-helix strategy refers here to the model where the city, the industry as well as the local universities firmly co-operate in order to create for instance new innovations.

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