Non-user centered design of personal mobile technologies

Jo Herstad
Department of Informatics
University of Oslo
Box 1080 Blindern
N-0316 Oslo
+47 91 56 05 63
jo.herstad@ifi.uio.no

Dagny Stuedahl
InterMedia
University of Oslo
Box 1161 Blindern
N-0318 Oslo
+47 99 72 81 56
dagny.stuedahl@intermedia.uio.no

Do van Thanh
Telenor
R&D
Snarøyveien 30
N-1331 Fornebu
+47 90 97 71 02
thanh-van.do@telenor.com

ABSTRACT
During design and development of personal mobile communication technologies, various user centered design approaches are frequently used. Based on results from three ethnographic studies of bike messenger operations, bike police operation and field engineering operations, we argue that understanding of the non-user and the relation between the user and the non-user is important. The cellular telephone is used as an example of a personal mobile technology throughout the paper to talk about the role of the non-user and the relation between the user and the non-user.

Keywords
Mobility, system development, contextual inquiry.

INTRODUCTION
Telephones have become ubiquitous in the western world. Today we take the fixed telephone for granted in private and public places. It is acknowledged that the introduction of the fixed telephone led to major changes in society [5], both for the users of the technology and for the ones that do not use it. Even for groups that do not integrate the telephone into the daily life in the western world the telephone represents changes in everyday routines [12]. Today, derivatives of the fixed telephone, the computer and the radio are used in homes, at offices and public places. Both the use of cellular telephones, pagers, PDAs, augmented reality technologies [3] wearable technologies [10, 11] are at rapid speed entering into various public and private places, like restaurants [7], parks, pavements, homes, beaches and office premises.

End user, user, consumer, community, buyer, client, owner, focus groups, participant, person, actor, operator, panels - these are notions that are used to describe various actors when doing design and development or investigations of the use of personal mobile technologies. There are indeed many terms that are used to denote the person interacting with a communication or information system – in addition to the general term "user". In this paper we are asking the question "is there any relation between the user and non-user of personal mobile technologies?" Then we are trying to find out what we can learn from answering this question.

The paper is built up in the following way. We start by describing what we mean by the non-user. After this, we present the empirical research that has informed the discussion about the non-user of personal mobile technologies. Before the conclusion and call for future research in this area, we present theoretical concepts from the "social construction of technology" tradition which enable us to talk about the non-user.

USERS AND NON-USERS
We argue that the concerns of the non-users are important when working with investigations, descriptions, analysis and design of personal mobile technologies. By considering the non-user, possible negative consequences for the non-users may be reduced, possible positive consequences may be enhanced and possible neutral consequences of use understood. The non-user is a person who is in the region of a user. The region of a user is described as a location that is bounded by the perception of the material sensory faculty of a person [6]. The description of the user, the non-user, uses and non-use is not rigidly defining categories in this paper, because of the dynamic and fluid nature of these phenomena. A person may indeed be a user in one location or in one situation and a non-user in another situation.

In *PDC 02 Proceedings of the Participatory Design Conference,* T.Binder, J.Gregory, I.Wagner (Eds.) Malmö, Sweden, 23-25 June 2002. CPSR, P.O. Box 717, Palo Alto, CA 94302 cpsr@cpsr.org
ISBN 0-9667818-2-1.

In a given region, there may be none, one, two or more people present. If there is only one person, there will be no non-users, since a non-user exists on the background of users in the region. If there are two persons present in the region where one person is using personal mobile technologies and the other person is not using this technology we have a situation where there is one user and one non-user.

When talking about users and non-users, it is important to be clear about who is who. Should we understand a user A, who is calling from a fixed telephone to user B, who is using a cellular phone, as a user of mobile communication technologies? Since almost all people in the western world are users of fixed telephones, and from time to time make calls to cellular phones are we all becoming users of mobile communications technologies? This question raises a general concern about who the non-users of mobile technologies are. As the example indicates, from one perspective there are no non-users. However, we will call any person that is not using or operating the personal communication terminal directly as non-users in this paper.

FIELD STUDY

The field study that has informed this paper has been conducted with the contextual inquiry technique [2] of bike messenger operations and bike police operations and field engineering operations at various places. Usability engineering techniques [4] have been used to analyze and inform design about central issues concerning the user and the use of mobile communication technologies. The communication systems in use are on the infrastructure side cellular systems, private mobile radio systems and Internet infrastructure and on the terminal side, cellular phones, pagers, palmtop computers, smart phones, cellular packet devices, radios, and handsfree sets. In the following description, we will use the term personal communication appliance as a generic term for any terminal component. The use of the various personal communication appliances has been investigated when the user is using footwear, bicycle and automobiles for physical movement in space. The use of telecommunication terminals and services while biking has been the main object of study for this research that started in 1997. One full time researcher and eight part time students conducted the research.

By using the contextual inquiry technique, we have been able to collect information about the context in which various technologies for physical movement, footwear, bicycles and automobiles are used together with various technologies for communication over distance, the personal communication appliances. The contextual inquiry technique has made it possible to describe the user side of these technologies, but also the non-users that are part of the context that has been studied.

From our field studies, we have identified a number of non-users and relations between the user and the non-users. One such instance of a relation between a user and non-user is presented below in the form of a strip of talk:

Bente: Hello.

Anders: Where is it?

Hans: At the other place.

This strip of talk is between Bente who is working as a receptionist, Anders who is working as a bicycle messenger and Hans who is working as a dispatcher. Bente and Anders are co-present in a reception area, and Hans is at the bicycle dispatching center. Hans is present in the ear-piece worn by Anders by his disembodied voice channeled through the cellular telephone and the corresponding services and networks. Bente is here the non-user. She is attempting to greet Anders who is approaching her desk with the word "Hello" and the corresponding gesture and facial expression. Anders is engaged in a conversation over distance with Hans, and he is asking and receiving a reply from him. This strip of talk has introduced a person who we call the non-user. In the next section, we will describe the experience of a non-user and the relation between the user and the non-user.

NON-USER EXPERIENCE

We are interested and concerned about the non-user and about how users and non-users experience the use of personal mobile technologies in situ. Our starting point is our five human sense-organs, i.e. the faculties of eye, ear, nose, tongue, and body, and their corresponding objects in the external world, i.e., visible form, sound, odour, taste and tangible things. Only the realm of acting with communication artifacts in contexts is included in our discussion. We will therefore also try to describe how these artifacts are patterning actions and behaviour of the non-users that are sharing space with the users.

The cellular telephone is used as an instance of a personal mobile technology, and the experience of it with respect to the five material sense organs is described below. We will see that the examples illustrate the relationship between the user and the non-user of this technology as an inter-dependent relationship. This description is made, so that we are able to analyze the non-use of personal mobile technologies. The descriptions below illustrate the relation between the user of a cellular telephone and the non-user with respect to the five material senses.

Visible form region: The eye of the non-user will see the visible form of a personal communication appliance from some distance. Since the personal communication appliances are often substantially smaller objects than a human body, the personal communication appliance may be

inside bags or pockets, and hence not exposed visibly to the non -user. The size of the region is different in crowded places and secluded places. The non-user will be in the visual region of the personal communication appliance, when the personal communication appliance is both switched on and off. In dark places, the light emitted from the personal communication appliance, and not the body of the personal communication appliance itself will determine the visible form region. The non-user will normally see the whole user of the personal communication appliance when in the visible form region of the personal communication appliance.

Sound region: The ear of the non-user will hear the sound of the personal communication appliance at various distances. When the personal communication appliance is off there will be no sound region. Sound may be generated by the personal communication appliance itself, or by the user that is talking with the appliance or with a distant party. If the personal communication appliance has loudspeaker capabilities, the non-user may engage actively in the use of the personal communication appliance.

Odour region: For current cellular terminals this region is not relevant for the discussion.

Taste region: For current cellular terminals this region is not relevant for the discussion.

Tangible things region: The body of the non-user is normally not experiencing the tangible things region of the personal communication appliance when the non-user and the personal communication appliance are in close proximity. The user and the non-user of the personal communication appliance may operate the personal communication appliance together, for sharing visuals and audio from the personal communication appliance.

The description and analysis above is done to illustrate the effects of the senses that the use of the technology may have on the non-user. Since the non-user is affected by the use of the technologies it is of importance when considering the use of these technologies.

When being together in the physical world, we are used to communicating with facial expressions, body postures and voice. When we use artifacts as extension of our senses, there are some challenges and possibilities arising. Donald Norman [8] describes the turn signs of a car as the facial expression of automobiles. When we use an automobile, the non-users will perceive the "person and the automobile" as one entity. What co-present people observe then is not our facial expression, but the hull of the automobile? The user of the automobile is perceived as approximately two tons of steel, some light, horn and turn signals. When a user of clothes and shoes is in the proximity of a person that is not using clothes and footwear, the non-user perceives a "person that is dressed in clothes and footwear". If we dress in an automobile or if we dress in clothes, we will be perceived differently by the non-user.

What happens when our engagement is not visible to the co-present people in our region, that is to the non-users? What techniques, methods and technologies do exist to guide and help the user and the non-user in situations where there is a conflict between communication in the shared region between the communicating parties, and invisible communication outside the region? This is one of the questions which the focus on the non-user has triggered. In order to find answers to this and other questions that arise when considering the view of the non-user we need an adequate vocabulary and a theoretical framework. In the next section, we will present some background theory that has provided a language with which we can talk about the non-user.

RELEVANT SOCIAL GROUPS

From the tradition of social construction of technology, we will look into some analytic devices that may be useful for our concern of the non-users. The approach of social construction of technology (SCOT) is concerned about relevant social groups [9]. A relevant social group is defined when "all members of a certain social group share the same set of meanings, attached to a specific artifact" ([9], p. 30). However, the description also includes less obvious social groups that need to be included. In the case of the automobile the "anti-automobile actor" is an important relevant social group. The concept of relevant social groups gives analytic devices to describe and analyze various groups and the problems and solutions that are perceived by them in the meeting with new technological solutions.

Pinch and Bijker (1989) point out the importance of dividing the defined social groups into several groups, since groups are heterogeneous. In the case of defining non-users as one relevant social group it would be of importance also to divide non-users into categories of different reactions and experiences with the technology in question. The development of technologies is seen as a social process, where there is interpretative flexibility by the various relevant social groups of the perceived problems and solutions. The social construction of technology discipline has mainly been used for historical analysis of the development, diffusion, stabilization and closure of technologies. The part of non-users specifically and relevant social groups generally that are affected by the use of technology might also be used to inform design.

The seminal book "The Social Construction of Reality" [1] has had a large impact on various scientific disciplines since it was published. The theory presented in this book is also the background theory for the social construction of

technology tradition. This discipline views the construction of technological systems and artifacts as a network of actors that are involved in evolving and stabilizing technological systems. The description and analysis of how technological artifacts are engineered, invented, designed, implemented, adopted, developed and stabilized in social construction of technology is different from the linear development model of technology that is found in many system development methods. The interpretative flexibility from various social relevant groups is a key point.

By the concept of interpretative flexibility, different interpretations of artifacts are captured, making it likely to show "that different social groups have radically different interpretations of one technological artifact" ([9], p. 41). The concept is used to show how artifacts are culturally constructed and interpreted. Combined with the perspective of non-users, interpretative flexibility opens up for discussing how different interpretations by users and non-users are culturally negotiated, ending up in norms of behavior and habits of use of the artifact. One example of this would be the expected withdrawal from the audio region of non-users when receiving a phone call on the mobile telephone, while it is still accepted to answer an SMS message in the same region.

SUMMARY AND FUTURE WORK

In this paper, we have investigated the role of the non-user and the relation between the user and the non-user of personal mobile communication technologies. We have argued that there is a relation between the user and the non-user of such technologies.

With the increasing use of personal communication appliances in private and public places, and the technology research that is going on in the area of wearable computing and communication and augmented reality, we argue that this is an important concern today, and will likely continue to be so in the future.

There are a number of questions and concerns that have to be considered carefully, and that are opened up in this paper:

- Finding out who the non-users are.
- The challenge of getting the view of the non-user.
- Answering the question of what problems and solutions the non-user perceives.
- The challenge of incorporating the view of the non-user in the investigation method and the design process.
- Finding out in which ways the user affects the non-user, and the ways in which the non-user affects the user.
- What effects will the non-user centered design have on the "haves and the have nots" [13].

There are a number of challenges in this area of non-user centered research. A starting point is to engage in ethnographically oriented studies of current practices. This to be able to get rich descriptions of the whole context of use, and not narrow task descriptions, profiles of users, goals of the operations and so forth – limiting the object of study to the user and the use of the technology in question.

Examples, and sound theoretical foundations, are necessary to prove that better solutions will be the result if the non-users are taken seriously, for the operators, the vendors and the customers, in addition to the non-users. It is possible to learn from the user and non-users of domesticated and stable technologies such as the automobile.

We will continue to investigate the use and non-use of personal mobile communication technologies.

ACKNOWLEDGMENTS

Thanks to Gisle Hannemyr and Odd-Wiking Rahlff and for interesting discussions.

REFERENCES

1. Berger, P. and Luckmann. T. (1966). The Social Construction of Reality: A Treatise in the Sociology of Knowledge. London: Penguin Books.
2. Beyer, H. and Holtzblatt, K. (1998). Contextual design, defining customer-centered systems. San Francisco: Morgan Kaufmann Publishers.
3. Butz, A., T. Hollerer, et al. (1999). Enveloping users and computers in a collaborative 3D augmented reality. In: The 2nd IEEE and ACM international workshop on augmented reality (IWAR 99). San Francisco, CA: IEEE.
4. Carlshamre, P. (1994). A collaborative approach to usability engineering. Linköping studies in science and technology. Linköping, Sweden.
5. Fischer, C. S. (1992). America Calling: A Social History of the Telephone to 1940. University of California Press.
6. Goffman, E. (1963). Behaviour in Public Places: Notes on the Social Organization of Gatherings. New York: The Free Press.
7. Ling, R. (1999). Mobile phones and restaurants: Human factors in telecommunication. Copenhagen, Denmark.
8. Norman, D. A. (1992). Turn Signals Are the Facial Expressions of Automobiles. Addison-Wesley Publishing Company.

9. Pinch, T. J. and Bijker, W. E. (1989). The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other. In W. E. Bijker, T. P. Hughes and T. Pinch (eds.), The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology (pp. 17-50), Cambridge, MA: The MIT Press.

10. Rahlff, O. W., Rolfsen, R. K. et al. (1999). The role of wearables in social navigation. In A. J. Munro, K. Höök and D. Benyon (eds.), Social navigation of information space (217-236). London: Springer.

11. Rhodes, B. J., Kortuem, G. et al. (1999). Wearable computing meets ubiquitous computing, reaping the best. In: The third international symposium on wearable computers, San Francisco, California, IEEE Computer Society.'

12. Umble, D. Z. (1992). The Amish and the telephone: resistance and reconstruction. In: R. Silverstone and E. Hirsch (eds.), Consuming Technologies: Media and Information in Domestic Spaces (pp. 183-194), London, Routledge.

13. Wresch, W. (1996). Disconnected: Haves and Have-nots in the Information Age. Rutgers, NJ, USA: Rutgers University Press.