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# Co-designing with and for families

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Abstract: To develop technology for families we need to shift
perspective from the more common technology development
for domestic environments or the smart home. We believe
that to develop and design useful technology we have to
understand what families' needs and desires are. This paper
describes some aspects of the co-operative work within the
research project, interLiving.

The interLiving project, "Designing Interactive
Intergenerational Interfaces for Living Together", is funded by
the European Union as part of the Disappearing Computer ini-
tiative. The three-year project aims to study and develop,
together with families, technologies that facilitate communi-
cation between generations of family members living in differ-
ent households.

interLiving builds on the Scandinavian  design tradition and is
multidisciplinary with researchers from computer science,
ethnography, industrial design and psychology. The partici-
pants represent different ways to conduct research, design
and technology development work. We use combinations of
diverse collaborative methods like workshops, cultural
probes, technology probes, interviews, prototypes, etc. Also,
researchers and users work closely together throughout the
whole design process.

In this paper we will focus on users as individuals leading
their every day lives and through that give us input to the
design process. How are design decisions taken, which are
taken and why?

### KEYWORDS
Communication, Families, Multidisciplinary Design, Co-opera-
tive Design, Collaborative Design, Participatory Design,
Ethnographic Studies, Industrial Design, Design process,
Design methods, Technology Probes,

## INTRODUCTION
### BACKGROUND
In academia and in industry there are many projects that are
focusing on technology in domestic spaces and the Smart
home like the Casablanca project (Hindus, 2001) and 3Com's
Audry (Smith, 2000). None of these are available on the mar-
ket today though. Many of these technologies are developed
by technicians or researchers and for people with similar
lives, surrounded by technology, always up to date, compe-
tent on handling new technology, travel a lot, have a huge IN-
box, etc.

Even so, the aims with these technologies are often well
meant. They are developed to help people do everyday tasks,
like shopping, washing or looking after your elderly folks, to
lead your life more efficient and easier. The solutions are very
often "techy" both in functionality and appearance.

You can, for example, track your children with help of their
mobile phones. To gain control in your life the technology
helps you controlling other people in your surrounding. The
control panel for booking the washing machine or configure
the web-cam security scanning is a computer screen with all
the features Microsoft software has. Does your children, or
your old parents, want to be tracked so that you can feel at
ease? Has a computer screen the ultimate appearance to be
hung on the wall in your home? There are many questions
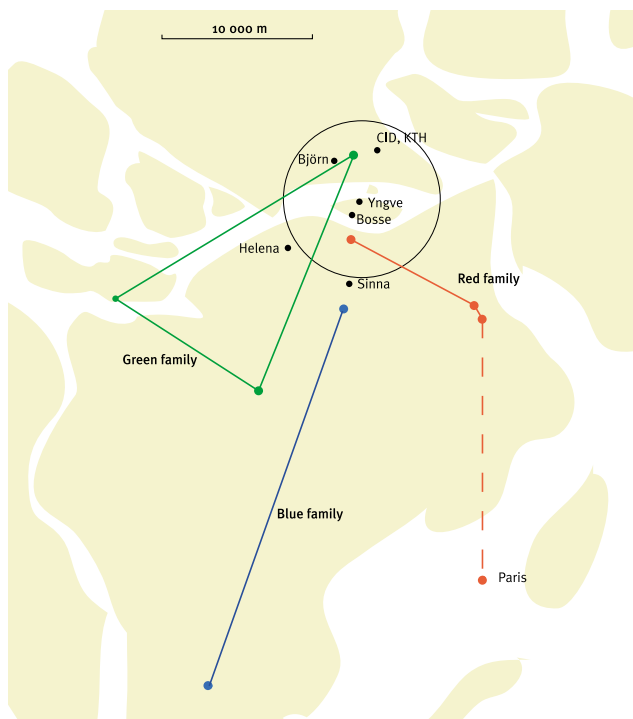that can be posed concerning technology in the home.



*Fig.1 Map over Stockholm with the position of the house-
holds where our collaborating families live are represented.
The researchers homes and our lab as well.*

In this paper we will, by discussing some aspects of the research work in a project called interLiving, focus on what we think is a shift in perspective on technology for everyday usage, from designing technology for the domestic space to designing technology for individuals in their context.

### INTERLIVING

interLiving, "Designing Interactive Intergenerational Interfaces for Living Together" is coordinated by CID (Centre for User Oriented IT-Design) at KTH (the Royal Institute of Technology) in Stockholm, Sweden. Partners are INRIA (Institut Nationale de Recherche en Informatique et Automatique) in Paris with Wendy Mackay as leading researcher there and LRI (Laboratoire de Recherche en Informatique Université de Paris-Sud) with Michel Bedouin-Lafont as head of the research team there. interLiving is funded for three years from 2001 by the EU IST FET research initiative "The Disappearing Computer".

We work together with three families in Sweden and three in France. This paper deals with the work done in Sweden but similar work is done in Paris by our two partner research labs.

interLiving builds on the Scandinavian design tradition and is multidisciplinary with researchers from computer science, ethnography, industrial design and psychology. The participants represent different ways to conduct research, design and technology development work. Also, in the EU FET (Future Emerging Technologies) research planning there is a strong awareness of the importance and value in bringing in end users as design and development partners (Wejchert, 2001).

Our hypothesis is that co-operative design is a successful approach. So, in January 2001 we put an add in Metro, a free Stockholm subway tabloid, searching for "Families to participate in research project about communication and new technology". The criteria were that they should consist of three generations and live in not more than two hours form Stockholm. We received 40 replies and chose three of those. The three participating families in Sweden consist of eight households spread out in the city, in the archipelago and in the countryside. They live both in apartments and houses.

We call the three families Red, Blue and Green. The youngest participant, when we started, was nine months and the oldest one seventy-two. To work with real families mean that we will co-design with individuals of different age, different skills, different wants and needs. A three-year project means also that we will co-design with the same people for three years. This means that their age, skills, wants and needs, perhaps, will change over time.

### METHODS AND MULTIDISCIPLINARY DESIGN TEAM

interLiving has two related objectives: To develop novel and appreciated communication artefacts and to improve design methods.

But how do you do co-operative technology development with families? Depending on the users different age, skills, needs and desires we knew that we had to approach the individuals in different ways. You cannot make a four year old do the same things as a fourteen year old or a forty-four year old. By engaging the family members in several different methods and activities, we get to hear and see many different aspects of their life.

We strongly believe that co-operative design is a successful approach. In interLiving this means expanding this field from mainly dealing with work related matters into families. To understand the needs of families in their every day life, to develop innovative artefacts that support these needs and to understand the impact such technologies can have, we use combinations of diverse collaborative methods like workshops, cultural probes (Gaver et al., 1999), technology probes (Beaudouin-Lafon et al., 2001 & 2002), interviews, prototypes, etc. This approach is known as triangulation (Mackay, 1997). The methods are fully described in "Co-design methods for designing with and for families" (Westerlund et al., 2003).

Mixing and trying out methods is one way of approaching our group of users as individuals for design work. It is also a way of understanding how these methods can be improved. We want to investigate which ingredients from each method that are important during the development.

With co-operative design we also mean that the multidisciplinary research group, consisting of an industrial designer, a computer scientist and an ethnographer, should work closely together continuously during the whole project. There should be no "handing over information" between ethnographers and computer scientists for example. At least two from the research team should be present at every activity with the households.

Another important issue here is that we all, users and researchers, have experience of family life. We all belong to a family. Therefore, we are not striving for all design decisions necessarily to be made by the users. We have for example decided that we will not engage in any technology that has to do with surveillance. There is commercial technology available for that, and besides it has very little to do with communication within family life, even though some parents think it would be convenient.

## DIFFERENT POINT OF VIEWS ON AVAILABLE TECHNOLOGY

Today some people say that, soon, when broadband is available to everybody and when everybody can to be connected all the time, people can work from home, check how their children are developing at the day care centre and shop through the Internet (Metakides et.al. 2003).

If that should be the ultimate goal for everybody, we need to know how that can happen, because technology does not just happen. We also need to know if being connected with the whole world all the time is what

*Fig. 2 and 3 show two kitchens with different characters. Probe photos.*

people want. What do we want to do with this kind of technology? In interLiving we experience a gap between some of these descriptions of technology and real peoples lives.

### WORKING IN THEIR HOMES

We visit the households to do low-tech prototyping. On other visits we install technology. This often starts with setting up an ADSL connection and thereafter the technology probes and prototypes. For some households it took us more than two years before this was technically possible. All these activities take time, sometimes almost ridiculously long time. The good side of this is that it gives us more insight and other stories of the families' lives.

When the day for broadband installation eventually came for the Blue nuclear household, we drove to their house in the outskirts of Stockholm. The installation involved two grown up family members, one teenager, a computer scientist, an industrial designer, new network cards in the family's own computer, several phone calls to "support", etc. The scheduled one evening installation became two days. No one still knows why the installation did not work the first day. But one afternoon one of the sons happened to connect a telephone to an outlet that his parents didn't know of and then the ADSL connection started to work. And after that the ADSL works even without the extra phone connected. These kinds of time and effort consuming activities, is the reality for all of us, researchers as well as family members, when working with technology and the home.

### ASYMMETRY

Also, many of our partners express a need to be left alone without someone being able to phone or access them all the time. The mother in Red family was very

clear on that point. – "It is not everybody's right to be able to contact me all the time!" She has four children, the youngest was nine when the project started and the oldest was 21. She works full time and is family life head coordinator since her husband is travelling a lot in his work. He on the other hand would like to have technology to make him feel the family life when he is away. He would like something that is not as intrusive as a telephone but just gives him a subtle notion.

### APPEARANCE

But, it is not only a matter of understanding what technologies the families are willing to drag into their homes and lives, what it should do and how it should work. We need to get the whole picture, which includes the products' appearance and expression. "We surround us or not with all kinds of things. There are certainly practical reasons but we also have more subtle, symbolic reasons for doing so." (Nippert-Eng, 1996)

We need to be able to design the artefacts in such a way that the families will accept to have them in their homes. This will of course include all kinds of aspects like status, exclusiveness, etc. The results could even involve "invisible" design, where the technology is hidden. Since interLiving is a research project, we do not have to consider aspects such as marketing, branding, manufacturing, distribution, disposal, recycling and price. We only have to consider the situation when the artefact is in the home or in the pocket. The focus is on the "needs and desires" that the families express.

Of course, there are lots of technologies like mobile voice phone, SMS, e-mail, etc. that are appreciated by a great amount of people in the "developed" world. These technologies naturally are used by members of the interLiving families as well.

*Fig. 4. The BongoFax designed during a workshop.*

## HOME VS. FAMILY

The home and the domestic space is and has been the topic of much research, for example the Equator project in the UK (Equator web) and the Aware Home at Georgia Institute of Technology (Mynatt, 2001). Some, aiming at making them smart, other secure. interLiving instead focuses on families. The most differentiating aspect is that a home is a place, a context, while families involve people. Families sometimes are at home but the members of a family are also visiting friends, at school, at work, playing football, in the hospital, on vacation, etc. And what is even more significant is that they just as often are between different places. Families always change in some aspects. Children are born and everybody constantly gets older and older until we die. But other aspects, like kinship, do not change. Your mother will always be your mother.

### FAMILY VS. INDIVIDUALS

It is not possible to generalise and please everybody with one artefact. People put personal meaning into artefacts (Csikszentmihalyi, 1991). In Figure 2 and 3 we see cultural probe photos of two kitchens. The different owners have expressed that they have a nice kitchen. The artefacts are presumably chosen and arranged with great care. The pictures show that the styles and characters differ between the kitchens. The owners would probably not agree to switch any single artefact between the kitchens.

How you create meaning with artefacts and the ordering of your belongings is totally individual. The meaning created can be similar between two individuals, but you create it yourself. This is also true concerning communication aspects of technology. Studying the example above, mother in Red family, everyone can see that what she wants is something completely different from what her husband wants.

But there are other examples as well. During a joint family workshop about technology and communication, the oldest son in Blue nuclear household created what he called a BongoFax (Fig. 4). He made a model of a "body fax", a device that could send his whole body

somewhere else, like a teleport seen in science fiction movies. It could come in handy when the bathroom is occupied for example. –"Then you just dial your granny's telephone number, turn up at her place, use the bathroom, dial you home number and get back home".

The Blue father's concern during the same workshop was that he never knew where his three sons were. The father explained that the children usually disappear when the whole family is going away from home by car. He wanted to put GPS on each and every one of them to be able to track them.

The BongoFax could be regarded as a design idea that would have to be ruled out since there is no technology available to build teleports. But seen in relation to the more control-oriented device that the rest of the family build, mainly the parents, it can be regarded as an escape device. Being able to "collect" all his children with the help of positioning devices made sense to the father, but not at all to the children. They did not see any problem in this: They were not lost. The BongoFax emphasises that being on their own makes sense to them.

So, the way they want to communicate, or use technology, is not necessarily symmetric. Family communication is not the same as the sum of what the individuals want and need to communicate.

## USERS AS INNOVATORS

"Standard" participatory design approaches include having users create design ideas, to have them express problems that need solutions, etc. Often this is done in a rather restricted setting, like a workplace. At work places, there are often helpful boundaries that limit the design space, often a specific task that is in focus.

Another common approach is to start with technology. Specific technology is developed and presented to a group of presumptive users. Users might be able to adapt to use the technology for a while or for long-term use.

We have investigated a different approach in interLiving. To successfully develop communication artefacts that make sense to people within diverse, extended families, we believe that we need to understand the lifeworld of these families. This means getting to know their needs, desires, preferences and expectations. But as stated above, their needs, desires, preferences and expectations will differ among the individuals.

Instead of general descriptions that are reduced and without detail, we focus on actual descriptions of real situations that make sense to the family members. These descriptions should cover the whole context of the situation.

We know from experience that users normally have difficulty in verbalizing blue-sky ideas that are relevant to

their situation. We do not expect them to "tell" us what they want. The work is done together, we guide them through the combination of diverse collaborative methods mentioned above and they project their lifeworld through them.

### WORKSHOPS

The workshops have at least two objectives: to generate design ideas and to get to know one another. We start the workshop activities by introducing something that frames or focuses the work. This is not done so much verbally as visually, like showing video clips from interviews with the households.

After this introduction, the workshops usually continue with a "use scenario". This is developed with the help of critical incident technique where the participants express something real and recent that has had some meaning to them. It could have been something problematic, a breakdown or it could be something nice that had happened to them. In interLiving this should involve some type of communication with others. All this helps keeping the work relevant to and reflecting their real life, expressing real needs and desires. These scenarios work as foundations for the generation of ideas and low-tech prototyping. It is easy to forget details in the design scenario if it is only presented verbally. Therefore, we emphasize that the results should be shown in action.

The Bongo Fax and the control panels above are examples of design ideas that were preceded by step-by-step design scenarios. They are not only design ideas, but also tell us that communication can be asymmetric.

### CULTURAL PROBES

The first thing we did after establishing contact with our families was to give them a kit of Cultural Probes. A recently developed technique for getting information about users is Cultural Probes – maps, postcards, disposable cameras, and other materials "designed to provoke inspirational responses" (Gaver, 1999). We sent them diaries, disposable cameras, etc. that would, when returned back, inform us of their lives and relations. We wanted to get back examples of real communication as well as real context.

One of the probe photos from a couple in Green family, in the thirties, shows a bookshelf with several vases in it. On the back of the photography, the woman has written that she liked the vases and the man that he does not like them. The woman had received them as gifts from her parents and sister. This is another example of an asymmetry.

The diaries revealed that instances of non-communication are as important as communication that takes place. One example is a mother that wanted to speak to her daughter that was going away for several weeks but she decided not to call her until the following day when she would have more time.

### INTERVIEWS

We followed up with interviews at the families homes based on the material in the probes. Among the great amount of stories were several about mothers not wanting to be reached all the time, while their children and husbands thought that they had the right to reach them. Very significant was also all discussions about the importance of meeting face to face.

### TECHNOLOGY PROBES

To get a better understanding of their technology use, we developed a method that we called technology probes. The concept of technology probe combines the social science goal of collecting data about the use of the technology in a real-world setting, the engineering goal of field-testing the technology and the design goal of inspiring users (and designers) to think of new kinds of technology. For us, technology probes are tools that both help us study how family members communicate and at the same time, motivate them to think about new kinds of communication technologies. (Beaudouin-Lafon, Deliverable 1.2).

A well-designed technology probe is technically very simple and very flexible with respect to possible use. It is open-ended and should inspire new activities by the family members. It is not a prototype or early version of a technology because it is not planned to be developed further. Rather, it is a method to help us determine what kinds of technologies would be interesting to pursue.

The technology probe involves installing a working technology into the families' homes and watching them use it over a period of time. Once placed in the home, it should encourage family members to experiment with it in ways we haven't considered and reflect aspects of how the family members interact with one another.

We have developed three technology probes; the videoProbe, messageProbe and storyTable.

The messageProbe is an application that runs on a computer, but the users should not experience it as such. It is basically a shared writing surface available at two or more distant sites. It is implemented with pressure sensitive displays so that all the interaction is done on the screen with a pen on digital post-it notes. What is drawn on one screen is seen on the other screens instantly. This way it resembled the familiar action of drawing on paper.

When installing the messageProbe in Blue nuclear household, the mother said that it would be convenient if they had this kind of shared surface between their house and the summerhouse in the archipelago during the summer holiday.

The fifteen year-old son didn't want to go to the summer house, and the parents were concerned what he would be up to all by himself at home. The father asked if it was difficult to put a web-cam in their house and connect it with the computer in the summerhouse. He

wanted to hide it in the kitchen so he could spy on his son. – "If he is sitting with all his friends around the kitchen table crowded with beer cans and I talk to him on the phone, asking what he is doing and he says 'nothing much', I still know what he is up to", said the father.

While the objectives of the probes are to expand design space, generate more ideas, the prototypes objectives are to narrow that space, to help make design decisions.

### PROTOTYPING

Working with low-tech prototypes in the families' homes is very successful. It is easier for them to narrow down functionality to concrete design when it is done in the right place. But we have also done mobile paper prototyping, prototypes they carry with them and make prototype work while they are living their lives. This facilitates them to narrow down functionality to concrete design when they are in the right context for what they are doing.

The inside of the Blue family's front door was suggested as a good place to leave messages on an early probe photo that the family sent us. This photo would be rediscovered a year later and function as one trigger to "The Door Prototype". The idea of "the Door" is investigated through a series of different prototypes. First several low-tech ones like paper pads and Post-it notes that the family has used in their home. The result from these has impact on the software prototypes that the families use later.

## CONCLUSION

The fact that we blend researchers with different backgrounds together with users in every part of the developing process, help us in understanding the users lifeworld better. Together users and researchers innovate communication artefacts that make sense to the families. This is done with the systematic use of a combination of diverse collaborative methods and repeated reflections. During these activities we focus on descriptions that cover the whole context of real situations that make sense to the family members.

It is not sufficient to reduce human action into simple concepts like "communication, coordination and collaboration". This categorisation might give some guidance to initial understanding, but the intentions, feelings, context and values have to be considered and understood as well. But to fully understand the details requires an understanding of the whole. And that in turn requires an understanding of the details. This shift of emphasis between detail and a broader view is very rewarding but also time consuming.

As one example, partly described above, we can look at the concept of asymmetry. It has emerged out of reflections of the data that the families have generated. The concept then is used on other everyday situations to see if it functions as a means for understanding and describing them as well. Finally all the communication artefacts that we are developing support asymmetric aspects of communication.

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