

# User Centered Research for Interactive Television

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## **Abstract**

This paper presents results from a qualitative user study. The aim of research was to include the future users of a new technology in the product design of interactive television programs. During the study, the study participants were interviewed. They were asked to answer questions about their television use and to comment on artist's drawings presenting the possible future setup and equipment at home. The study resulted in users' stories and innovations of interactive applications for the future.

## **Keywords**

User centered research, interactive television, users' stories

## **Introduction**

Some reported studies on user centered product design for the television will be described here next. For example, users have been included in the design of an integrated television and VCR [Petersen et al., 2002], a set-top-box [O'Brien et al., 1999] and on-screen displays, remote controls and a satellite dish [Logan 1994]. There are also results from usability testing interactive multimedia services [Hvannberg & Larusdottir, 2000], Electronic Program Guide prototypes (EPGs) [Eronen & Vuorimaa, 2000] and interactive documentaries where the user can select a path through the documentary [Nardon et al., 2002]. Attempts to move from usability testing to collaborative design has resulted in new methods and tools. For example, designing access to PC functionality and applications through a TV set has led to the development of cooperative tools for creation of ideas [Bødker et al., 2000].

In addition to qualitative methods, quantitative methods also reveal information on the real use of the product. An example of a quantitative user study was conducted to evaluate a Web-based EPG [Smyth & Cotter, 2000]. Here the content personalization system learned from user's online activity at a given Web site and automatically constructed a profile for filtering information for the user. Also log file data from actual Web usage has been used in designing an EPG with a low entry barrier [Baudisch & Brueckner, 2002]. There

is also a quantitative user study conducted in the home environment that included approximately 500 TV viewers [Gauntlett & Hill, 1999]. Their responses to questionnaire-diaries on their life and their television watching were collected for over a five-year period.

## ***Leisure Time Activities and the Home Environment***

Studies in the home environment are important as the use of consumer products is in many ways different from the use of products aimed to be used mainly at work. For example, watching the television as a leisure time activity is not composed of tasks to be accomplished or distinct goals to be achieved as is the case with many activities in the working life.

Qualitative user studies reveal information on the nature of TV viewers' leisure time and the home environment. An example of a qualitative user study conducted in the home environment revealed that technology was routinely used in a variety of different ways within the home [O'Brien et al., 1999]. The harmonious coordination of everyday domestic activities was based on sophisticated understanding of family members' activities and uses of technology as is the use of the television or radio. The study revealed ethnographic data and an evaluation of a prototype set-top-box for the provision of digital services to the home.

Another long-term empirical study of television use in the home environment revealed that the use

of new technology continuously develops in a complex interplay between the user's expectations, user's needs and the context of use [Petersen et al., 2002]. The devices at home are integrated parts of physical devices with unique kinds of interfaces and their use is shared.

### User Centered Research

In the early stages of user centered research, there was a tendency to include the future users in the product development in the very final steps of new product design. User feedback was welcomed during usability testing sessions, long past the completion of the initial design stages of a new technology. Usability testing helps to find the usability problems, but a lot of effort is saved by conducting usability testing already in the early stages of new product development. In these early stages, the final product can be simulated with low-fidelity prototypes such as drawings, scenarios or paper mockups. It has been found that low-fidelity prototypes are as efficient in detecting usability problems as is the final high-fidelity prototype [Virzi et al., 1996].

Usability testing of existing devices does not, however, tell directly which new technologies could help meet the users' future needs. To obtain more information on user needs and users' real working environments, researchers arrange field trips. During the field trips, researchers observe users using technology tools in their authentic contexts of use, either at work or at home. Ethnographic research is based on field trips where the aim of research is to develop a thorough understanding of users' current work practices or leisure time habits. If the researchers can't visit the users, the users can collect the data themselves and then send it to researchers. For example, users can participate in the data gathering by taking photographs [Eronen, 2002a and Gaver et al., 1999] or they can write diaries and answer to questionnaires [Eronen, 2002a, Gauntlett & Hill, 1999 and Gaver et al., 1999].

### Interviews, Focus Groups and Users' Stories

Usability testing and ethnographic research are good methods for obtaining user data and feedback from users. There is however a gap between field studies and design, or user



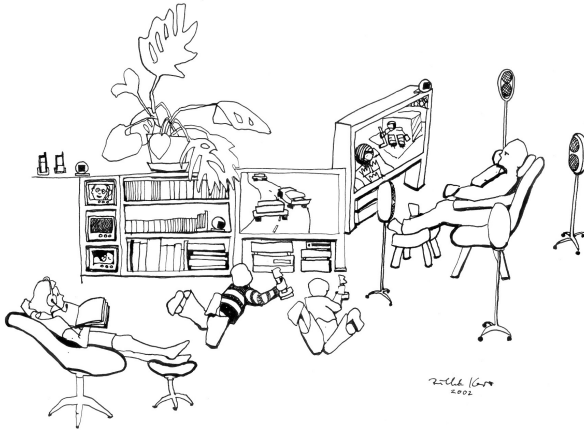
**Figure 1.** A study participant during an interview.

requirements and design. To overcome this gap and to provide examples of future product concepts to designers, there is a need for research methods that enable the users themselves to initiate new ideas. A simple approach is to conduct interviews or focus group sessions with the future users of a new product, asking for their opinion on a set of questions during a structured or a semi-structured conversation. The results are then analyzed to find important examples and user experiences [Rubin & Rubin, 1995].

An important result from interviews and focus group studies is users' stories. Stories describe users' intentions and motives, their interactions and the contextual information [Imaz & Benyon, 1999]. Stories may have many viewpoints and a complex structure as the changing of viewpoint may imply some future consequences of early actions. Users' stories are able to inform the development of new products by providing users' own design ideas [Taylor & Harper, 2002]. Stories and storytelling made by designers themselves help to model and design HCI systems [Erickson, 1995].

### Methods

The qualitative user study presented here next consists of four interviews with TV viewers. It is a continuation on studies resulting in new concepts of interactive television programs made by ten TV viewers [Eronen, 2002a] and ten designers in a broadcasting company [Eronen, 2002b]. Four study participants in the age range of 29-37 years participated in the study. Two women and two men answered a set of questions



**Figure 2.** Artist's view of the living room in the future.

during the interviews which took 80-110 minutes each (cf. Figure 1). The interviews were recorded for later inspection and the results are presented in the next section.

In the beginning of an interview, three "Artist's view of the future" drawings were shown to a study participant (cf. Figures 2, 3, 4). A semi-structured conversation followed. The study participant was asked to comment on the drawings presenting the possible future setup and equipment in different locations at home.

None of the study participants had yet purchased a digital set-top-box for themselves and they didn't know what the present services and applications look like. In general, the study participants first wanted to see the new digital services to be of use to them before purchasing a set-top-box.

The reason for using artist's drawings instead of photographs or pictures of present services is that we wanted to give more freedom to study participants to relate to their own past experiences and wishes when considering their future needs and preferences. It was easier to talk about the study participants' future needs when they were not provided with images of what is already available.

The second part of the interview dealt with selected new TV program concepts designed in a broadcasting company beforehand. This part of research serves the needs of product development of that broadcasting company, and the results are therefore not available here.

## Results

The interview results are presented here next. For the purposes of this paper, the 26 pages of interview results were shortened substantially. All study participants' names were changed to protect privacy. As the interviews were conducted in Finnish, the quotations shown in this paper were translated into English.

Susan, a 30-year old physiotherapist answered questions about which TV program types could become important in the future:

Q: "The television in the future will have something for everyone. In your opinion, what type of TV programs there will be?"

A: *"I could think that (some channel) would broadcast more, all types of, historical material, from the recent history. It could create more interest (among the TV viewers) in the (historical) issues in the future."*

Q: "In your opinion, what type of TV programs could bring the family together to watch a TV show?"

A: *"As a family, we could watch Nature series together. Children get interested in them as well. And as funny as it might sound, I'm myself interested in Sports. The soap operas are something I couldn't think of watching at together with the children."*

Andrew, a 29-year old elementary school teacher answered questions about the future equipment in the living room (cf. Figure 2):

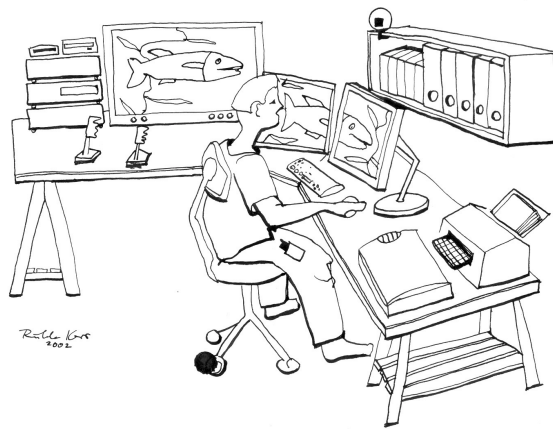
Q: "Here is a drawing of the living room in the future. In your opinion, is this a realistic picture?"

A: *"I doubt about the father's pleasure to watch the movie, or the sports event, next to these children playing the TV games. I play the PlayStation2 games myself and as I know the resulting side tones, well.. Maybe you wouldn't enjoy watching the TV show as close (to children) as this. And furthermore, I can't afford to as much equipment as you see in the picture."*

Andrew also had an opinion on the present and future TV shows:

*"I believe that in principle people want to watch the same type of TV shows as they do today. They want to see News and Sports, maybe some series, some of which are more entertaining and some of which are more into culture."*

*"The children are a large market niche, they will certainly get new types of TV programs. You already have the 'product family' TV programs. You must buy children's toys according to the TV series, and clothes. Probably you'll get more of these."*



**Figure 3.** Artist's view of the work room at home in the future.

Andrew answered a question about what the work room at home could be like in the future (cf. Figure 3):

Q: "What type of TV programs could one watch at in the future in the work room if there was a TV set?"

A: "School kids could have it as a homework to watch a short movie. They could watch it (in the Web) when they have time. Today at school, I show them "School TV Programs" in Finnish. 10-11 year-olds can follow a foreign program with subtitles. But with subtitles, most students lose the track of the TV show if the subject is difficult. (Therefore) I prefer to show them Finnish programs."

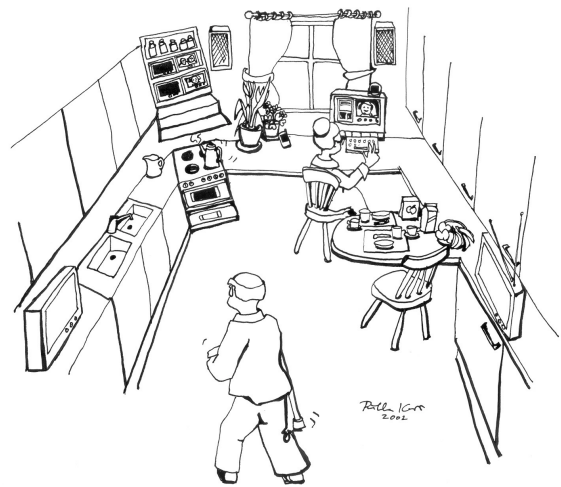
Susan answered questions about having a TV set in the kitchen (cf. Figure 4):

Q: "In the kitchen, what type of TV programs could one watch at in the future?"

A: "We don't spend that much time in the kitchen, and in my opinion, you don't watch TV when you are having a dinner. In general I think it would be quite fragmental to watch TV in the kitchen, maybe while you are having a quick snack."

"As for today, we see the living room TV while we are at the kitchen table. The only reason for me to buy a (separate) TV set for the kitchen would be the two Morning TV Shows which we surf intensively. We watch the two shows according to the topic, and surf between the two channels. I can't think of any other program we would watch at in the kitchen."

"In the Morning TV Show, I want to see short News and if there are any interesting visitors in the studio. In my opinion, you could leave out the Cuisine



**Figure 4.** Artist's view of the kitchen in the future.

*programs shown on TV in the morning. They take too long. Who has the (time and) energy to write down the recipes?"*

Helen, a 37-year old woman with a Master's degree in Economics, also answered questions about having a TV set in the kitchen:

"For example, let's assume these people (in the picture) are a retired couple. You could have a schedule (in the TV) for the day, (a list of things or some work) you must do after the morning routine. If you have to pay the bills, then (the program) gives you a reminder on the screen: 'Remember to pay such and such a bill', 'Water the plants' or 'Order something (online)'."

"I could think of (an interactive) program that helps you with the practicality, and (where) you could write down something for yourself in some free space. Or you could do scheduling for the coffee machine or the oven, if (everything) is connected to the set-top-box. I use the scheduling function a lot in my mobile phone. I could as well use it in my TV. If we go into very automatic (style of life), (the program) could tell you what to have for a dinner, and it then reminds you to buy certain ingredients."

### **Innovations of Interactive Applications for the Future**

During the discussions, the study participants created innovations of interactive applications for the future. Some of them are presented here next.

The user interaction needed to make a television program interactive can take place either directly or indirectly. Direct user interaction takes place in four different ways. Users' opinions and answers can be sent to the TV show with the remote control and a modem in the set-top-box, or there

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can be an SMS sent from a mobile phone, a phone call or a postcard sent to the TV show.

Indirect user interaction takes place when users visit Web pages or Teletext pages of the program during or after the TV show. Users do this to get more information on a chosen topic but they don't necessarily send their opinions to the TV show. Therefore they don't have a direct interaction with the TV show or the other users.

Helen's example of an innovation with direct user interaction is as follows: *"I suggest that in the future children will have more programs related to their games and hobbies. The home is a place where children do things together (with adults and other children). It will be a counterbalance (in children's lives) to everything else, and machines will help in that. An example is a program based on an interactive adventure that has a well defined plot. This is for the older children, the youngest ones can't possibly take part in that."*

*"Then if we think about the Web use or the use of a mouse, children could solve drawing tasks with an instant feedback. Truly, I have thought about it, it could be very important for many children. Especially if you don't get (such) feedback from the school or preschool you want. There could be a connection to the Web or some game (in the set-top-box) and several children in the family could play it together. Older children could help instruct the younger. During the program, you get a point and a verbal feedback, 'You have succeeded' or 'Wow, what a lovely drawing'."*

Susan created an innovation with indirect user interaction: *"I work at a health club and I would like to see (an interesting) Fitness program on TV. The topics discussed in the program would cover fitness and health issues, taking exercise and where to go to exercise a certain new form of physical activity. I'm also interested to hear what is happening in the health clubs in other parts of the world as this is part of my job description. I could think of watching a TV show shot in a famous health club in US and taking notes on what they have there and what we don't yet have here. It is fine for me to see the program only once a week or twice a month, not every day."*

In this case, it would be easy to launch a Web browser and visit the Web pages for the program on the TV screen after the TV show. The Web pages would include photographs and links to the health clubs presented earlier in the show.

Helen created an innovation with indirect user interaction: *"I suggest that the Morning TV Show(s) will survive. For many, (to watch the program) has become a certain kind of a ritual. At least, you watch the Morning News. (In the future) it could be that the*

*program takes only a portion of your TV screen. There is (many) different 'boxes' on your screen and one of them contains News. You don't have to open it up completely, (the screen) looks like a computer screen with various windows. You would also see stock rates running along. In some corner there could be a list of the TV programs for the day, just to see there is nothing unusual."*

Austin, a 29-year old lawyer created an innovation with indirect user interaction: *"I'll take a hiking trip to north of Finland next month. (If there existed a program on nature tourism and) if it had a connection to something I'll do myself, I could go to their Web pages. I haven't followed programs on traveling much but if I had it in my plan to travel somewhere, then I could go (to their Web pages) to see if they come close to what I had in my plan."*

## Discussion

The qualitative user study presented in this paper was based on a semi-structured conversation with users. The semi-structured conversation is a method for focus group sessions. Here it helped the study participants to discuss about their future needs and preferences.

The study participants found it easy to talk about the TV shows they were interested in to see in the future. They innovated new applications that would provide them more information and entertainment in areas they were interested in.

However, the study participants found it easier to innovate for the 'living room TV' than the 'work room TV' or the 'kitchen TV'. This might depict that watching the TV is considered more as a social activity to be shared with other family members in the living room, and the individual spaces as the work room don't attract the family members to spend their leisure time as much as the living room.

## Future Work in Home Environment

Three "Artist's view of the future" drawings were shown to study participants who then related stories from their own experiences. Study participants considered their future needs and preferences for interactive applications in each room separately: the living room, the work room and the kitchen.

The equipment at home and the separate rooms have already been a subject of research in several studies. For example, it has been found that the home environment and the daily routines create 'behavioral clusters' [Mateas et al., 1996]. Families spend most of their time in so called 'command and control' or 'hangout' spaces, which imply to

the living room and the kitchen. Many activities are characterized as communication to support emotional bonding rather than carrying out given tasks.

There are also results from designing social communication devices for the home [Hindus et al., 2001] and a study of the technology use and the internal structure of the household-technology interaction [Venkatesh, 1996]. These results imply that the relationship between technology and our social world is important and needs more attention.

The 'possible future setup and equipment at home' presented in this paper in the artist's drawings is already a reality for some families. It is common today to have a living room TV, a separate TV in every bedroom and the kitchen, and several VCRs. The different types of use contexts at home result in different types of user needs. In the future, this might result in the design of specified interactive applications for specified types of TVs. Therefore, more research is needed to discover the user needs and user's tasks in the different use contexts these entertainment equipment must support.

### **User Interaction and System's Response**

An interesting research area for the future arises from the user interaction. Namely, human-to-human interaction follows the social conventions for real-time interaction. A conversation, and also the process of dialog itself can be valuable, not just the results of the conversation. This is due to successful exchanges of information about the participants' attitudes and feelings which change moment by moment during the conversation.

Signals that express our emotions are often non-verbal and generally sent and received without conscious attention. PC and Web-based technologies don't usually handle this type of communication, focusing on the exchange of information. Therefore, the human aspects of real-time social interaction and the modelling of user's emotional states are an interesting research area [Tsukahara & Ward, 2001].

It is not yet known how human-computer interaction of the entertainment technologies for the home environment handles this type of communication. However, it was found in a series of media studies that people responded to TV and the mediated presentations as if they were actual people and objects [Reeves & Nass, 1996]. For example, in study participants' opinion, the TV

news segments seen on a TV set labeled 'News Television' were significantly more important, informative, interesting and serious than the same news segments on a TV set labeled 'News and Entertainment Television'. It was concluded that human beings assign social roles (specialist, generalist) to media to reduce uncertainty about their world.

The entertainment technologies for the home could emulate some aspects of real-time social interaction and people's roles during the interaction, in which case they would make user interaction more pleasant, sympathetic and supportive.

### **Conclusion**

The user study presented in this paper is an example of a qualitative user study including the future users into the product design. The study participants were interviewed and they were asked to comment on artist's drawings presenting the possible future setup and equipment at home.

In general, it is difficult to discuss about non-existing future devices or applications. The use of artist's drawings instead of pictures of present services enabled the study participants to relate to their own experiences from their past television use. It was easier to talk about study participants' future needs and preferences when they were not provided with specific images of services already available.

The study resulted in users' stories on their television use and their innovations of interactive applications for the future. Many of the innovations in the subsection 'Innovations of Interactive Applications for the Future' are quite close to written scenarios. It is possible to combine users' stories and edit them further to make longer scenarios. For example, a set of stories could exemplify "An afternoon at the Jones's" where every family member has a story to tell. Here short stories put together make a larger scenario.

New user requirements can also be extracted from users' stories. The drawback of using users' stories is the transcription of the interviews which takes a lot of time. The rewards in users' stories is that they are the 'authentic voice of the users'. For example, during participatory future-scenario workshops the future users are given new ideas by the designers and researchers which then mold their opinions about their possible futures. Meanwhile during an interview, the user has more freedom to talk about his own experiences

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that are of importance to him. During a workshop, the user faces more social pressure that for example makes it uncomfortable for him to air dissenting opinions.

It is concluded that much of what people do is socially driven and based on communication. The design of new devices and interactive applications for the home environment must take into account how people use and understand the new technologies as part of their everyday activities.

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