

# EARLY STAGES OF DIGITAL TELEVISION: USER RESEARCH AND APPLICATION INNOVATION

Leena Eronen

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## Abstract

This paper presents results of a user study including ten users. The study participants gathered data on themselves in their home environment over a three-day period. They also designed innovations of future interactive applications for digital television. A subsequent interview with the researcher revealed more of the study participants' thoughts of the interactive applications for digital television in the future. The research work in general concentrates on the subject of how to take the future users into account in the very early stages of product development.

## 1 Introduction

Product development of new and novel products is difficult. Most product development is devoted to applications for which target users are known or can be reasonably well defined. In contrast, new and novel products, especially the consumer products, have no explicitly defined user groups. Examples of such products are home entertainment systems like Web-TVs, set-top-boxes and VCRs, whose computing power is rapidly increasing. Designers have to decide on the new product functionality and features before they know precisely who the future user of the product is. Users of these new products don't expect to operate a computer system, they span all ages, and their preferences, capabilities and motivations vary. Also, with entertainment and telecommunications technologies, product requirements are prone to change over time.

Interactive applications for digital television are an example of new and novel products for which there are no earlier product versions to learn from. One of the challenges in product development is to find an answer to the question, "What the new product will be used for?" Without prior knowledge on the subject, an existing product version or a prototype, a user cannot address any particular user needs when asked. With digital television, there exists some studies on user testing the new services, namely Electronic Program Guide prototypes [4, 8]. There are also results from ethnographies [13] and experiences of formulating profiles of user groups for digital television [3].

## 1.1 Aim of the study

The research work in general concentrates on the subject of how to take the future users into account in the very early stages of product development. The research questions for the study include the following:

- How to gather data on users and their home environment
- How to reveal user needs that are hidden or subconscious
- How to make innovations of new and novel applications with users
- How to equip users in order to make them equal research partners with the researchers

In the early stages of digital television, the designers have to find methods to reveal users' subconscious user needs concerning a product they have never used before. The designers also need to predict which tasks users want to accomplish with such future applications, and how users' preferences will change over time. The approach used in this paper is to do user research on the use of existing, similar equipment and try to find innovations with the users. In addition to new concepts of interactive television programs and applications for the digital television, we also need new research methods that help to include the future users into the product development.

## 2 Qualitative user research

Qualitative user research takes form in interviews, observations, focus group studies, diaries, photographs, storytelling and other similar methods. Qualitative user research aims at providing rich insights into the human, social and organizational aspects of human behaviour. For example, interviews aim at obtaining rich data for building theories that describe a setting or explain a phenomenon [14]. Based on the interviews, researchers try to find the underlying concepts that reflect the ideas with which the study participants label their descriptions and understandings of their world.

Qualitative user research results in large amounts of data to be organized, analyzed and represented. Qualitative user data can be represented with the aid of scenarios, storyboards or rich pictures. 'Wall graphs' are used to represent complex, cooperative work in the workplace including people, their activities and the outcomes of their work [15]. Affinity diagrams help organize and represent a large amount of data about work practices [2]. Scenarios are widely used for different tasks such as presenting ideas and providing support for brainstorming, gathering the field data, and they also provide a prototyping technique for user testing [12].

### 2.1 Ethnographic research

Ethnographic research includes field research methods like observations, interviews, videorecording and collecting of documentary evidence like notes and photographs. The traditional approach with ethnographic research is to ask a researcher or a group of researchers to do the data gathering [7]. Ethnographic research is a time consuming approach as it takes a long time to arrange the field trips, collect the data and analyze the material collected. One way to avoid this is to use two or three person field visit teams which make

'interactive observations' on specific topics with the informants [9]. In this study, the informants were encouraged to make maps of information based on their own experience and specific history graphs with personal experiences. The approach gets close to participatory user research methods presented in the next subsection.

## 2.2 Participatory user research

Ethnographic research methods include the user in the research process as a source of information. The nature of the research process has it that the user is not an equal research partner in the research process but more or less a subject of research. However, there are research methods that rely on the user as an active participant in gathering and interpreting the information. For example, a research called 'Cultural Probes' aimed at finding new ways as how the new technology could enter and affect the everyday culture [6]. The study participants were supplied with maps, postcards, disposable cameras and booklets. The study participants then sent back to designers their answers to questions, the inquiries, a photo album and a 7-day media diary. Yet more participatory user studies have focused on studying participants' lifestyles, activities and attitudes [5], the information capture in working life [1] and the use of digital images in children's leisure related communication [11].

## 2.3 User research in the home environment

Ethnographic studies in the workplace often reveal that study participants' behaviour is goal oriented. For example, a user study on information capture in working life revealed that the study participants did not use the digital cameras to gather information for its own sake, but rather did it to use that information in some other way [1]. An administrative assistant gathered information from diverse sources and redistributed it to others, and a journalist collected newspaper clippings for reuse as he was writing new articles. However, goal oriented user behaviour can not be transferred from the working life to the home environment as such. When people do leisure time activities as watching the television, they don't have tasks to accomplish or distinct goals to achieve. Instead, there are activities and daily routines at home. The home is at different times a place of escape, a place of work, a place of privacy and a place of public exhibition of the tastes and values of the householders living there [13].

It has also been found that the home is likely to prove an important site for new information technologies which do not necessarily have to be migrated from the industrial or work sphere to the domestic. The convergence of technologies which links the computer with communication and entertainment technologies has created new applications for the home like domestic banking, home shopping and video on demand. Telecommunications and entertainment industries treat the home as the next site for technological development. An example of the design of such future devices is a 'digital family portrait', a device providing information on daily activities of a senior citizen living independently of extended family members [10]. The digital portrait changes daily, providing qualitative visualizations of a family member's daily life that would naturally occur to someone living in the same home.

## 3 Methods

The user study presented here is a continuation on research resulting in a set of user groups for digital television [3]. During the research, both quantitative and qualitative user data were collected. The quantitative data, results from a questionnaire study, and the qualitative data, results from a set of focus group sessions, were combined resulting in three user group profiles. The three user group profiles were easy and fast to update with more focus group sessions when needed. In this case, the focus groups revealed specific data on users' expectations on forthcoming services in the digital television in Finland. The group profiles didn't however include visual data of individual TV viewers. It is known that visualizations help designers to get closer to users and thus help them produce design ideas. We decided to make a participatory user study to get more specific data and visual information on selected TV viewers.

Ten persons from the focus group sessions were asked to gather data on themselves in their home environment. Five women and five men in the age range of 16-78 years participated in the study. They received an envelope with questionnaires, separate questions, two diaries and a disposable camera. The approach has been adapted from a research called 'Cultural Probes' mentioned above [6]. The study participants completed questionnaires, filled in the diaries of their television watching over a three-day period and took photographs of objects and incidents at home. They also designed innovations of future interactive applications for themselves. A subsequent one-hour interview with the researcher revealed more of the study participants' needs for specific types of information and their thoughts of the television in the future. The interviews were recorded for later inspection.

## 4 Results

Results of the user study were collected in ten separate user profiles, each 8-18 pages in length. The user profiles include information on study participant's favourite television programs and channels, use of the entertainment equipment at home, stories of television watching habits and the leisure time, two diaries, photographs, user's preferences for favourite future applications and new concepts of interactive television programs for the digital television. For the purposes of this paper, only two basic themes from the user profiles are covered, namely the study participants' innovations of the television in the future and their proposals for improving their favourite television programs. For innovations of future interactive programs and applications, it was assumed that the user interaction can occur in different ways. There can be a user interaction with the remote control and the set-top-box, a text message sent from a mobile phone, a phone call or a postcard sent to the TV show.

### 4.1 Proposals to improve favourite television programs

It is known that some television programs attract TV viewers to watch the same series for years. Are there features that could make the programs even more pleasing to watch? Some study participants proposed for interactive features that would enable them to see background information on their favourite television programs. A study participant with a favourite program called 'Men Behaving Badly' said: *"I would like to see background information on the actors, the scriptwriter and other television productions of this type. It was quite*

*interesting on MusicTV when they had the info boxes on the music videos. I'm interested in all references to popular culture and entertainment."* Another study participant keen on talk shows said: *"I would like to see background information on documentaries and talk shows. There would be a menu on the TV screen providing me the same information that the editors have already collected when editing the TV show. The information would explicate the arguments presented during the show. For example, when they talk about the depreciation of the value of money, the graphs barely flash on the screen. Now you could click on the remote and get them in sight again."*

A study participant with a favourite program called 'Futurama' wanted to collect a group of TV viewers to play a game where the players guide the actions of a chosen person on the program. This 'interactive scriptwriting' would then have an effect on the program coming next week. *"There would be difficult tasks on the program and alternative consequences that the group of people must work out. The program would show how some of the groups got through the tasks. These shots are not necessarily shown on the TV but on the Internet."*

An enthusiastic Formula 1 spectator wanted to have a racing quiz for Formula 1 fanatics. She said: *"It takes us 1½-2 hours to drive to our summer house, so we must make a plan when to go as not to miss the Formula 1 racing on TV. I would like to make a guess on who will do the next pit stop, who will drop out or which car will beat another. I would get points for correct answers and I can see the statistics from the races. I can also see camera shots from the pit."*

## 4.2 Television in the future

The convergence of technologies which links the computer with communication and entertainment technologies will create new applications for the home. Four user study participants will now tell what their television will look like in year 2006. A 27-year-old product manager said: *"My Future TV would recommend me the same type of TV shows I've watched before and there is an on-demand online quiz that doesn't disturb watching the TV show. The TV display is light and easy to set on its place. I can play board games like Trivial Pursuit with the family from the set-top-box memory and I can send text messages to friends with a snapshot I've taken with a digital camera. There is a family photo album on TV and I can Home Shop over a video connection with the salesperson in the shop in case I want to ask a question."*

A 46-year-old chief coastguard said about his television in the future: *"I want to have a personal self-study English language course on TV that I can start at a chosen moment. I want to see a cooking program on TV with new recipes in a chosen breadth with pictures, video and text. I can't use a cookbook and I don't believe many men can. A TV program is easier to follow as there you see the results. I also want to get travelling information on TV and video on holiday destinations. It would also be useful to read other travellers' stories from their holidays. I have travelled a lot."*

A 78-year-old senior citizen said about her television in the future: *"I want to have the Wheel of Fortune TV program on TV as I want to try if I could win something too. I want to have a special channel for retired people that presents the Church services, programs on current affairs, gymnastic exercises program and stories on recovery from diseases."*

A 55-year-old nurse said about her television in the future: *"I want to have an application on TV that shows me a live video from the grocery shop. I could select the products on the screen*

*and send my order to the shop. They would then deliver the products to my mother's home as she is 84 years old and needs help in doing the shopping. Then I want to have a video connection with a group of family members and a voice mail on TV. I also want to see bus and train timetables and I want to be able to do the ticket reservations. There should be light TV displays available, a small one for the table and a big one to be mounted on the wall."*



Figure 1. A study participant is watching the evening news with his youngest son

A study participant is watching the evening news with his youngest son (cf. Figure 1). There are four children in the family. The study participant said: *"The evening news is one of the programs that at the latest gets us together in front of the TV and we watch the program together. Children play football and often, if there is a football match on TV, we change the arrangements for the weekend. TV series or movies don't make such changes."*

## 5 Conclusion

In this paper, ten TV viewers were asked to gather data on themselves in their home environment. The user study focused on TV viewers' leisure time and the innovations of future interactive applications they designed for themselves. The study resulted in ten user profiles. Each profile includes information on the use of the entertainment equipment at home, the favourite television programs and channels, stories of television watching habits and the leisure time, two diaries and photographs, data on user's favourite future applications and new concepts of interactive television programs. Future research in the area of interactive applications for digital television includes application innovation with designers in a broadcasting company. The work will be based on the user profiles. The results, designers' innovations, will then be compared to users' innovations to see if their views of the future

differ from each other. Future research also includes more qualitative research, namely concept validation sessions with users.

## 6 Discussion

The user profiles provide information on both the present and the future and therefore they are valuable material for designers who try to shape the future. Television in general is a powerful media with a strong influence on the life of the individual and his or her behavior. The user profiles collected serve as a tool for designers they can refer to when they need information on future users of new and novel products. The user profiles include information on why the user is watching the television, what type of information he is interested in, how his favourite television programs could be made even more pleasing to watch, and what ideas does he have for the television in the future. The benefits of user profiles in the concept development of new program concepts will be seen during the future research. There are not yet studies available on the subject, the new concept development for the television, except for results on user testing some existing prototypes [4, 8]. A discussion of the method's pros and cons relative to existing research results is therefore not yet available.

It was stated earlier that it is difficult to do user research or concept design in the early stages of product development. The plan followed in this study was to make a qualitative user research on the use of existing, similar equipment. In this case, it was the analogue television. The user study of ten TV viewers in their home environment resulted in ethnographic data. The research method was not 'ethnographic research' in a sense that the user study participants, not researchers, collected the data. The research approach enabled the users themselves to gather the results, explain them and give their interpretations as why events happened. As the study participants took part in the evaluation of the data, the research method can be called participatory user research where the users were not mere subjects of research but they were equal research partners with the researchers in the research process.

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Leena Eronen

Helsinki University of Technology, Telecommunications Software and Multimedia Laboratory, P.O.Box 5400, FI-02015 HUT, Finland      leronen@niksula.hut.fi