Research Methods for Involving Hearing Impaired Children in IT innovation

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ABSTRACT

Involving hearing impaired children in research is not straightforward, as these children often have deficiencies in spoken and written language. Therefore, researchers cannot rely on commonly used research methods that are based on verbal communication. In this paper we describe a series of research activities that were conducted to understand the world of experience of hearing impaired children in order to generate ideas for innovative IT applications. A user-centered design approach was followed, in which potential users and stakeholders were involved as much as possible. The methods that were used to understand the target group are discussed with respect to the experience of the researchers. Successes and lessons learned are described and recommendations for involving target groups with whom researchers and designers cannot communicate as they are used to, are provided.

Author Keywords

Children, Hearing impairments, User-centered design, Methods.

ACM Classification Keywords

H5.2. User Interfaces: User-centered design.

INTRODUCTION

To design new products that match the users' world of experience, researchers, designers and developers need to thoroughly understand the users, their contexts and practices. They need to empathize with the users. In order to increase understanding and empathy, several methods have been developed to involve users in the research and design process. Examples of such methods are contextual inquiry, cultural probes, (participatory) observation, interviews, make & say methods, etc.

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When designing for an unfamiliar target group, empathizing with the users becomes both more important and more of a challenge. Especially when designing for users with disabilities, it is important to thoroughly understand issues faced by users as a result of their functional limitations [1]. To complicate things further, commonly used methods might be difficult to use with such specific target groups.

The focus of this paper is on the impact of not being able to communicate 'normally' with the target group on the research and design process. 'Normal communication' in this respect refers to all levels of communication between two or more people with fully functional communication skills. Hence, this includes both spoken and written communication, as well as verbal and non-verbal communication. Since most commonly used research and design methods in the field of human-computer interaction assume a common (verbal) language, these methods might not be usable. Therefore, it is necessary to adjust such methods or to seek others.

Hearing impaired children are a challenging target group for two reasons. First of all, they are children and therefore require a specific approach when involved in research and design [2]. Second, they have a hearing impairment. Communication with hearing impaired users is not straightforward for hearing researchers and designers since both groups do not share a fluent common language. Even though most hearing impaired children have a hearing aid or a cochlear implant (an implanted electronic device providing a sense of sound), allowing them to communicate orally to some extent, many hearing impaired children lack a fluent mother tongue [3]. In addition, because of their hearing impairments, these children often have deficiencies in spoken and written language skills. Working with an interpreter only offers a partial solution though, as researchers then have to rely on the interpretation of the interpreter, while the interpretation of what end users tell and explain is of key importance to user-centered design.

The research described in this paper was part of a user-centered design approach that was followed to generate ideas for new IT applications for hearing impaired elementary school children. We discuss the methods used in the first research phase of this user-centered design trajectory. The main goal of this phase was to understand

the children's everyday lives, their problems and their needs. We discuss the methods in terms of our considerations in the selection and application of the methods as well as our experiences with the methods. We provide recommendations for mapping the world of experience of users who lack 'normal' communication skills.

METHODS: SELECTION, APPLICATION, RESULTS AND EXPERIENCE

The target users of the current study were hearing impaired children of elementary school age in Belgium (6 to 13 years old). Two researchers carried out several research activities to map the world of experience of these children and to involve the target group in the research process.

Recruitment

Most of the activities in the research phase took place in an institute for hearing impaired children in Belgium. Besides the research activities at this institute, family interviews were also carried. In this paper however, we focus on the methods that were used at the institute.

Because of the exploratory nature of the project, the goal was deliberately formulated as open and broad as possible in order for the researchers to stay open minded. For many potential participants however, this exploratory goal of 'generating ideas for new applications' was confusing and indistinct, which challenged the recruitment process. Fortunately, the social-technological nature of the project sufficiently differentiated it from other studies, which triggered the interest of the institute for hearing impaired children and some other participants.

Another challenge with respect to the recruitment of participants was the fact that hearing impaired children are a vulnerable target group, and the employees of the institute thoroughly screened the researchers and their research plans. Many of the children at the institute already participated in several medically oriented studies, mainly focusing on the impact of cochlear implants. Consequently, the institute was quite careful in allowing even more researchers to approach the children.

The researchers not only needed to demonstrate how their research differed from other research projects, they also more or less had to 'prove' themselves in a first gentle contact with the children. In this respect, the researchers were kindly invited to attend a book launch event, where the author of a new children's book read her book to a class. Only after this first contact between the researchers and the target group, the school fully agreed upon participating in the research project.

Expert interviews

Before actually involving the target group in the research activities, it was decided to collect information from experts in hearing impaired children. Talking to the experts first allowed the researchers to get acquainted with the

characteristics of the target group and to understand the most efficient way to interact with the children.

Semi-structured interviews were held with professionals working with hearing impaired children, including a psychologist, a sign language teacher, the head of the institute's boarding school living communities, an expert in hearing aids and cochlear implants, and an educational expert. In addition to the expert interviews, more informal conversations were held with teachers and supervisors of the institute's living communities.

Many issues were discussed during the interviews of which the researchers were not aware before and which surprised them. One example was that the use of sign language has long been, and to a certain extent still is, a controversial issue in schools for hearing impaired children. According to some educators, teaching the children sign language will interfere with their acquisition of spoken and written language. Another example is the biased idea that many hearing impaired children have of romantic relationships due to missing out on much of the auditory context of what they see every day. Many of the experts gave examples of inappropriate sexually oriented behavior resulting from this lack of contextual information.

Besides the insights gathered in the interviews, the researchers learned from the experts how they could approach and involve the children. For example, they learned that they would be able to have a conversation with most children who have cochlear implants as long as it would be a one-on-one conversation and they would be in a quiet room. Also, the researchers discussed with the experts which research methodologies they could use to involve the children in the project. For instance, the school frequently asks parents and children to keep diaries. It was therefore decided not to use another diary or other form of cultural probes in this study.

Observations

The next step in the research phase involved observations. Observations were done in class and leisure situations on several occasions, including the passive observations during the book presentation mentioned above and participatory observations during a full day at a summer camp for hearing impaired children. Actively participating in all of the children's activities allowed the researchers to personally experience the behavior, communication, interests, sense of humor, etc. of the children.

Recording the observations was a sensitive issue. Photos and videos are important tools in communicating research findings to the design team in later stages of a user-centered design approach [4]. Videos are especially useful, since they allow for the preservation of several, often ambiguous or paradoxical qualities of daily life [5]. However, the institute was reluctant to allow the researchers to use photo and video cameras. After an official promise that recordings would only be used internally by the researchers and that no

photos would be published on which the children could be recognized in any way, the institute allowed the researchers to take photos, but not videos.

Creative class sessions

From the interviews and observations, the researchers learned that both verbal information processing and reading comprehension is a challenge for hearing impaired children. As a result, they have difficulties in understanding everyday information and lack optimal abstract reasoning skills. These problems are related to fantasy and storytelling. For hearing impaired children, following a story line which is completely different from their own reality may therefore be difficult, as well as empathizing with the story's characters. However, it was unclear whether this lack of fantasy or abstraction resulted from the fact that hearing impaired children have difficulties understanding stories and characters or whether they have difficulties expressing their fantasy.

With these problems in mind, exploratory creative sessions were organized. The goal of these sessions was to understand how hearing impaired children deal with visual stories. In addition, to understand better to what extent these children are able to make up stories and to detach themselves from what they have personally seen and experienced, the children were stimulated to use a non-verbal, visual means to express their fantasy.

Three sessions were held with children from five classes (in two sessions, children from two classes were mixed). The ages of these children ranged from 6 to 12 years old and the sessions included 7 to 12 children each. The institute's psychologist was closely involved in setting up the creative sessions. The teachers of each class were present during the sessions, as well as a sign language interpreter. As a sensitizing exercise before the sessions, the teachers were asked to discuss with the children which TV shows or movies they liked. Based on the children's preferences, six shows or movies were selected by the researchers for each class.

In the first part of the creative sessions, six of the selected fragments of the favorite TV shows or movies of that class were shown. After each fragment, the children were asked to fill in a rating card. Each card showed a still from the fragment and four items ('story', 'images', 'speed' and 'sound') with visual five-point scales (see Figure 1). Filling in these cards appeared to be more difficult for the children than was expected. After the first two sessions it was decided to make the ratings easier for the youngest children in the last session by replacing the visual scales with faces in which the children had to draw a smiling, a sad or a neutral mouth.

In the second part of the sessions, each child received a sheet of paper with six frames (for the youngest children this was later changed to three frames). They were asked to choose their favorite fragment, and to draw a comic story of

how they would like the fragment to continue and end. At the end of the session, all children were asked to present their comics to the group.

Figure 1 Video rating cards

Large differences between individual children were observed, both in their capacity to create a story and in their verbal storytelling skills. As was expected, fantasizing and empathizing with characters was difficult for many of the hearing impaired children. This was reflected by the fact that most children did not create a new ending to the story. Instead, they replicated the fragment that was shown in their drawings. In addition, when presenting and telling their stories to the group, most of the children stuck very close to their drawings. However, in some cases, the teachers were amazed by the stories some of the children came up with, indicating that some children were able to express themselves more openly and clearly through the use of a nonverbal means. In addition, these children showed more fantasy than their educational workers expected them to be capable of.

The subsequent sessions were done with children of decreasing ages, which turned out to be a good decision. By doing a session with the oldest children first, the researchers were able to adjust some elements of the methods that turned out to be difficult, such as the abovementioned rating cards. Also, in the youngest group, it was decided together with the teachers to provide a still of their favorite fragment in the first frame on the sheet of paper.

One thing the researchers had misjudged with respect to the creative sessions was their communication with the children. Based on their experiences during the participatory observations, the researchers expected that they would be able to moderate the sessions by oral explanations and instructions. However, in a group situation, most children needed support from a sign language interpreter. Fortunately, the school psychologist had foreseen this and arranged interpreters during all sessions. Their advice and help, and that of the class teachers as well, proved to be essential to bring the sessions to a successful end.

The overall approach that was chosen for the research activities described in this paper was highly pragmatic. Beforehand, the researchers had no clear focus with respect

to an application domain and the exact research steps were not worked out into detail yet. The research steps were set up in close collaboration with the institute where the activities took place, resulting in a flexible but practical and effective approach.

GENERAL DISCUSSION AND RECOMMENDATIONS

Involving a target group with whom researchers could not communicate ‘normally’ proved to be not at all straightforward. In this final section we will reflect on the research activities on a more general level and provide recommendations for involving target groups with disabilities affecting communication in user-centered design research.

Approaching vulnerable target groups

It is not only more difficult to communicate with a vulnerable target group, including hearing impaired children, but such target groups are also less accessible. In addition, vulnerable target groups may already be targeted in many other studies. Therefore, it is important to illustrate elaborately how the research makes a difference compared with other studies and what the added value will be for the target group.

Also, it should be kept in mind that institutes involved in research activities, have their specific views and understanding of the target group. Therefore, it is recommended to involve more than just one institution in the research, preferably institutions with different perspectives on the target group. For the project described here this was done in the design phase.

Finally, when approaching vulnerable target groups, several rules and restrictions may be imposed on the researchers. Obviously, these should be respected. However, if restrictions hinder elementary aspects of the research, it is worthwhile to negotiate, as was done with the institute’s psychologist and the parents in the family interviews in the research described. By carefully explaining the necessity of the approach, it is often possible to find a way to take into account the sensibilities of the target group without compromising the quality of the research.

Involving experts in the area of the target group

In retrospect, starting the research with expert interviews was a good choice. As a result, the researchers were much better prepared for the following research activities, especially with regard to the interaction with the children. Experts will be able to provide valuable suggestions about how to approach and involve the target group and how to communicate with them. This consulting contact with experts should be as open and as broad as possible. Allowing the experts to decide which information they share with you, will help to make sure that important issues are not overlooked.

In addition, researchers should collaborate closely with experts in the field of the target group to set up the most

efficient research design. However, they should also not forget that they are the experts in the research methods they use. In some regards, challenging the target group experts and their common understandings of the target group may yield unexpected insights.

Research methodologies

A general recommendation is to run all research activities with at least two researchers. Although this is a valid recommendation for any type of qualitative research, it is especially important with respect to highly unfamiliar and vulnerable target groups. Discussing and interpreting the gathered information together will improve the understanding of the target group and might reveal issues that are not yet clearly understood. For example, it took the researchers in the project described here quite some time to fully understand the nature of the language problems caused by the children’s hearing impairments.

Furthermore, it is useful to assess beforehand all possible communication difficulties that might arise between researchers and the target group. Never underestimate the impact such difficulties may have on the research and design activities.

Finally, as some research methods (creative sessions for example) might be new to the approached target group and relevant experts, they should be applied in a trial-and-error fashion. Flexibility to adjust methods and approaches is essential.

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