

User centred design for mobility aids

Johanna Schmidt, Marcell Illés, Kristin Paetzold

*Universität der Bundeswehr München, Institute of Technical Product Development
johanna.schmidt@unibw.de, marcell.illes@unibw.de, kristin.paetzold@unibw.de*

Abstract

Products for elderly people are often not very usable. In this paper a case study is described, where users of walkers were asked how satisfied they are with their walking aid and which problems they experience. The outcome of this was not only a better understanding of the users in handling their walkers, but some difficulties in using interviews as method to get requirements could be detected.

Keywords: *User centred design, mobility, usability.*

Introduction

Elderly people are often not satisfied with technical devices. On the one hand many technical devices are very complicated in handling and the way of operating changed significantly in the last years. As one example mobile phones can be mentioned. Ten years ago it was obvious, what was the display and what the keys to dial a number. Nowadays with touch screen phones it can be quite tricky to find the right button just to show the keys you need to dial a number. Even assistive technology often lacks usability and is hard to handle.

On the other hand, products that are made especially for elderly users are often stigmatizing. The keys on these products are so big that everyone can see that this is a special aid for elderly people [1],[2]. The same problems occur with mobility aids. They are either hard to handle or it is very obvious, that the user needs to be supported, what is stigmatizing.

Goals and objective

The project described in this paper has just started. Its goal is to find methods for the development of products to support mobility, as these products should be able to support as many people as possible. Mobility is essential for leading an independent life and for quality of life [2],[3]. Therefore aids that support mobility should be as useful and usable as possible. There are a lot of methods for product development, but obviously they are not appropriate for the development of mobility aids. Otherwise those products would not lack usability in that dimensions. By including the later users in the development process, it is supposed to be able to develop better products. Better in this case means more usable, more useful and more accepted.

The objective of this part of the project was to find out, how much information about the users, use-cases and needs can be found out by using interviews.

Background

In order to be able to design products that fulfil the users' needs, these needs have to be understood. On the one hand the use case has to be known quite well. In case of mobility aids this is the mobility situation. On the other hand the designer has to know the typical user and

his or her specific capability, needs and expectations. These aspects are described in this section.

Mobility

Mobility is a basic need of human being and a very important precondition for leading an independent life and hence for quality of life [2],[3]. Therefore it is crucial to support people's mobility as long as possible. Figure 1 shows domains of mobility in which people typically move in. These domains are characterised by people's familiarity with a certain area.

The first domain is one's home. This is a very familiar surrounding where people know the obstacles that may hinder their mobility and they can change the situation by removing these obstacles or by using special aids. The second domain is the familiar neighbourhood near home. In this area obstacles are known as well and even if they cannot be removed, they can be avoided. The third domain is an unfamiliar area, where culture and language are known, e.g. another city in the home country. This makes it more difficult to move in this area, as obstacle can occur unexpectedly. But by asking other people for help or alternative routes it is possible to overcome even unexpected obstacles. In the fourth area neither the area nor language and culture are familiar, e.g. in a foreign country on a holiday trip. This makes it really difficult to overcome an obstacle, if asking for help is not possible or at least difficult. The capabilities needed for mobility get more with every domain of mobility. But not only moving in one of the domains can be a challenge. The transfer from one domain to the next can be quite challenging as well, as means of transport or mobility aids have to be changed.

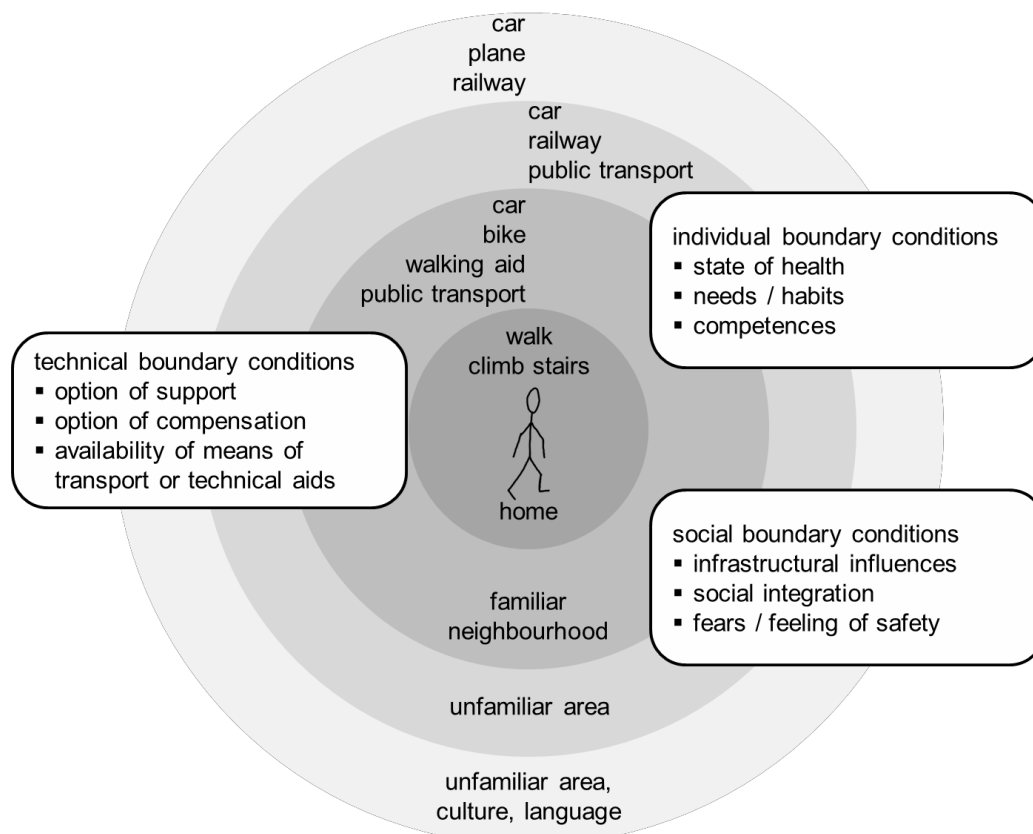


Figure 1: Domains of mobility [4]

Beside the characteristic of the domains there are boundary conditions for each person that can hinder or support mobility as well (described in the rectangles in figure1). The individual

boundary conditions are inter alia the state of health, one's personal needs and habits and the competences and capabilities. Social boundary conditions are e.g. infrastructural ones, the social integration and fears or the feeling of safety. These aspects are highly dependent of the neighbourhood somebody is living in. Therefore they can be changed in both directions, positive or negative, by moving house. The technical boundary conditions are inter alia characterised by the options of support and compensation that are available and by the availability of means of transport or technical aids. This depends partly on the neighbourhood as well, but it also depends on the amount of money that can be spent on mobility in any sense.

Users

In order to describe the integration of users in the design process, the term "user" has to be clarified. [5] divides users in three different groups:

- Primary users are people who use the product for its purpose. In case of the walker primary users are those people who are supported by the walker and use it to improve their mobility.
- Secondary users don't use the product, but they get in contact with the product and have to handle it. A typical example for a secondary user is a service technician, or in case of the walker nursing staff or relatives.
- Tertiary users get in contact with the product incidentally. This might be a bus driver who has to help the primary user to get on the bus with the walker.

For the user centred design it is crucial to know the users the product is designed for. The focus of the design activity has to be on the primary user. But the secondary users have to be considered as well, as especially in case of products for seniors they often have a strong influence on the purchase decision. Hence the product has to satisfy the primary user, but furthermore it has to be judged as useful by the secondary user, who is the customer in many cases, as well.

Method

In order to find out, which aspects influence the user satisfaction and acceptance of products a questionnaire was conducted. As example for a mobility aid a walker was chosen. Forty users of walkers were asked whether they would answer some questions related with their walkers. Seven of them were willing to do so. They were asked by phone. Due to the little number of participants this study is not statistically significant, but it can help to get a feeling for the kind of information that can be gained by this kind of interview.

Table 1: Overview over interviewees and walkers

| | | |
|-----------------------|-------------------|---------|
| Interviewees in total | | 7 |
| Male | | 4 |
| Female | | 3 |
| Living at home | | 7 |
| Age | | 47 - 72 |
| Walker | standard | 5 |
| | premium | 1 |
| | no information | 1 |
| Walker paid by | healthcare system | 5 |
| | partly private | 1 |
| | no information | 1 |

The interview started with some personal questions for age, sex and job. Then it was asked what kind of walker the interviewee owns, who choose it and who paid for it. The first part of the questionnaire ended with situations and activities in which the walker is needed and the disability or illness that causes the use.

In the second part it was asked for the use. Interviewees were asked whether they have read the manual and whether it was understandable. The situations in which the walker is used were asked for and the reaction of family and friends on the use of it. This was followed by some questions about the use and whether problems occurred. Some possible changes were described and the users were asked whether they would like these changes or not. The interview was closed with the question which additional functions or changes on the walker they would appreciate.

Results

The evaluation of the questionnaires revealed one interesting point considering the purchase decision, two different types of problems in using the walker and some problems in the method of interviewing users. These are described in the following.

Purchase decision

The question about who chose the walker revealed an interesting point. Only one user chose the walker by himself and one was chosen by relatives. Five out of seven told that either the doctor or the nursing staff in the hospital chose the walker. This is important to know for the user integration. As described above these are secondary users, but in many cases the purchase decision was made by them. Hence it is crucial to include the secondary users in the development process as well. Otherwise it can happen that the walker might satisfy the primary users, but they will never know it, as the walker is not bought. As only users of walkers were interviewed, no general statement can be given, but it seems likely that this is valid for more aids.

Problems with walkers

The first kind of difficulties occurs with the system itself. It is impossible to use the walker as an aid in order to overcome stairs. This is a problem itself, people who use a walker need handlebars in order to get up- or downstairs. They can use at most one hand to carry the walker. But in addition to that the weight is too high to carry the walker. Hence many people own more than one walker, one on each level. But this is only possible at home. If for example a shop has stairs in front of the door, in many cases it is impossible to use the walker inside the shop.

The walker can be folded in order to transport it, but there is no space for shopping left in the trunk of a compact or intermediate car if the walker is in it. Some walkers cannot be fixed in the folded position; this makes it difficult to get them into the trunk, as they unfold when lifted. Two of the users mentioned, that it is not possible to store two walking sticks on one side of the walker, but only one on each side. This makes it difficult to pass small doors, as the sticks are even broader than the walker itself is. One user told, that the shopping basket, which is integrated in the walker is too weak. Even if the maximum allowed weight is not reached, the handle deforms under the weight.

These are only some aspects that are problematic in the system itself. Some of them could be improved easily to provide more comfort; others need some more design effort.

The second kind of problem is using the walker in an imperfect environment. All users complained that is impossible to use stairs with the walker and even curbs are an obstacle that is hard to overcome. This requires some effort in planning routes without stairs or high curbs and it might lead to a longer distance. Though it is possible to walk on cobblestones, it is very

uncomfortable. There are no shock-absorbing components in the walker, so the wrists get stressed. In addition to that the walker tends to curve if one wheel gets between two cobblestones. This makes walking on rough surfaces very tiring.

As it is impossible to avoid the obstacles due to the environment, the walker has to be improved in order to provide a better support anyway.

Problems with the method

Asking users about their experience with the walker revealed some problems that occur in the daily use. But only some problems were mentioned by the users directly. In this case one of these aspects was the size that is too large for the trunk, which was mentioned twice. After asking the interviewees for problems they have, some problems that might occur, from the point of view of the interviewer were listed and the users were asked whether or not they know these problems. The question whether a curb is an obstacle answered six out of seven with yes, one didn't answer this question. But this was not mentioned before. This leads to uncertain result, as there may be several reasons for not mention it.

Maybe this is a problem, but the users do not feel severely hindered by it. But it also might be that it is really a big problem, but the users do not see any change to find a solution for it, so they do not mention it. Or they just did not think of this special problem in the stressful situation of the interview, but the problem is worth to mention.

In addition to the uncertainty why this particular problem was not mentioned, another aspect occurs. There may be several other problems the users have, but for the same or other reasons they did not mention them either. If the interviewer does not foresee that this problem may exist and asks explicit for it, he might not be aware of these problems, even after the interviews. Another problem with asking directly for specific problems is that the interviewee might get the feeling that he or she should have this problem. If he or she gets the feeling, the interviewer would like to hear that a particular problem occurs; he might answer the question in the way he feels he is expected to do [6]. In consequence of the wrong results this leads to products that solve problems which the users do not have.

Discussion

The results of these initial interviews reveal several problems. On the one hand, not all the problems that might occur can be detected; on the other hand, some problems with only little relevance for the users might become overestimated. This problem is shown in figure 2 on the left-hand side.

There are problems in using a technical system, but only some of them are mentioned by the users. And there are problems the interviewer asked for. But he cannot be sure, that the problems he asked for are real problems. This leads to the area inside the bold line. This is the area with problems the designer is aware of and he or she will try to solve.

In order to avoid these problems, interviews should not be the only method to get requirements from users. Asking users for problems in handling a technical system without asking for special problems will reveal some problems. The observation of the users while they use the product, either in their normal environment and use cases, or under defined conditions in a laboratory, can reveal more problems that occur in practice. This is shown on the right-hand side in figure 2. The area within the bold line gets bigger and it is completely within the circle of problems. Nevertheless it is not sure that all relevant problems are detected.

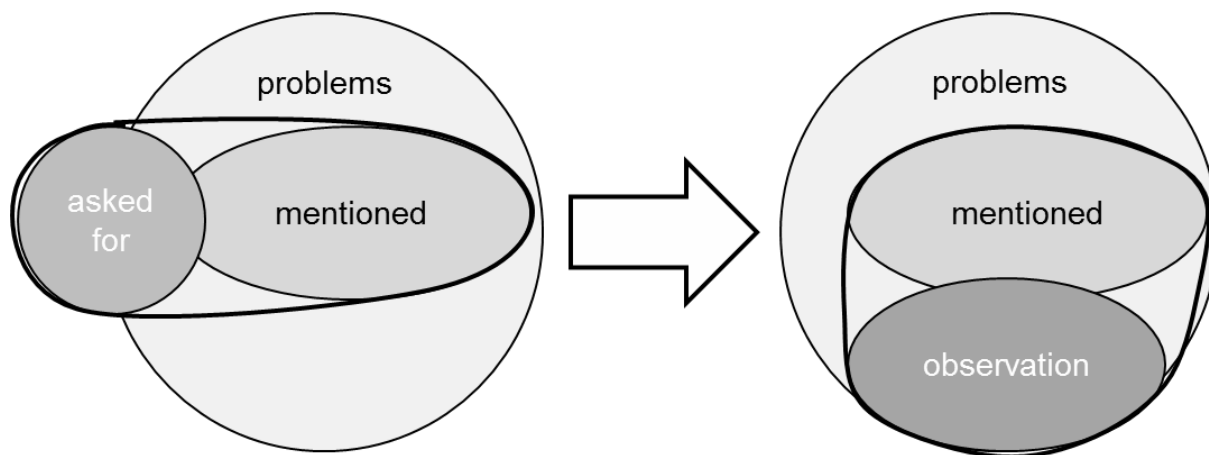


Figure 2: Problems detected with interviews (left) and with additional observations (right)

The problems with using interviews for getting the needs and requirements of users are not new. But age has a significant influence on the usability of methods [5]. So it was not obvious, in which dimension the problems will occur and how much information can be collected.

Conclusion and outlook

The interview seems to be a good method to get a first impression of how satisfied users are with a certain product they have used before. But in order to get detailed information about the users' needs and the requirements of the products it is not sufficient. Hence additional methods are needed to get satisfying results and to be able to design products that fulfill more of the users' needs.

The next step in this project is to find out which way of observation is the most promising. People can be observed in their daily life while they use a product. This makes the results probably more realistic, as the problems that occur during the normal use get detected. But maybe some problems are avoided by the users in their familiar surroundings. In case of the walker they might choose routes without obstacles, or in other cases they do not use a specific function of a product, because they are not familiar with it.

Alternatively users can be observed under test conditions in a laboratory. On the one hand observing users in special laboratories might cause a stressful situation for the user. As people may change their normal behavior, if they know they are studied (Hawthorne effect [6]). On the other hand the results are more comparable, as all users have the same conditions and the same task.

After finding suitable methods for getting requirements from users' needs, the inclusion of users in the later stages of the development process will be analysed and adapted to the special case of mobility supporting products for elderly users.

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