Eliciting Parents' Individual Requirements for an Inclusive Digital School System

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Abstract. Parents often have a busy time sorting out their life puzzles, including getting information about their children's activities in school. More and more communication between teachers and parents take place via digital school systems. It can be hard for parents to find the information they are looking for and the teacher decides when information is sent and what communication method to use. All parents, but especially parents with disabilities, might have individual preferences on how to receive information and how to adapt meetings at school. In this paper we present a project where we involved parents and teachers in focus groups, an idea workshop and iterative user trials of a digital prototype. The goal was to elicit parents' individual requirements for an inclusive digital school system, where they can store their individual preferences about how and when to receive information from school and what requirements they have on meetings at school. Preliminary results show that we managed to create open and focused discussions among parents and teachers. The parents reacted very positively on an onboarding page with the possibility to quickly and easily enter preferences after their first log in, but more work needs to be done on how preferences are categorized on the onboarding page. Finally, parents need to get clear feedback from teachers and school when they have entered or updated preferences, so they can trust that their preferences will be met.

Keywords. Universal Design, user involvement, user requirements, education, teacher-parent communication methods, storing individual preferences

1. Introduction

Parents often have a busy time sorting out their life puzzles, including getting information about their children's activities in school. They need to remember when their children have school outings and need to bring lunch packets to school, when their children need to bring sportswear and when there are parent meetings and discussions on progress between teacher, parent and pupil. They also need information about what themes their children are working with and important home works, to be able to support their children's learning. Furthermore, there could be late changes in the school schedule and the teacher might need to report to parents when a child is absent from a lecture.

More and more communication between teachers and parents take place via digital school systems, where teachers add information, or via weakly newsletters sent by e-mail to parents. It can be hard for parents to find the information they are looking for

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or to receive the information at the time they want and via the communication methods they prefer.

Current digital school systems do not support individualization of the communication between a teacher and a parent to a large extent. The teacher decides when information is sent and what communication method to use.

We see a potential in being able to individualize the communication between teachers and parents, especially for parents with disabilities, who might have individual preferences on how to receive information, but also for any parent, who might have individual preferences about receiving different information concerning children of different ages etc. Furthermore, parents with disabilities might have individual requirements on meetings at school so the meetings will be accessible and efficient. Today, parents have to constantly remind the teachers about such requirements and teachers have problems remembering all individual requirements from parents.

In the on-going *School Contact* project, we will find out what individual preferences parents with and without disabilities have. The goals of the project are to develop:

- A clear user requirement specification of how an inclusive digital school system should look like and work to simplify parents' communication with the school. These requirements should be able to be used as the basis for an agreement between the municipality and their supplier to improve their current digital school systems.
- A demonstrator (hi-fi prototype) of what such a system could look like and how it might work, developed by the supplier of a digital school system.

The improved digital school system should give parents a better overview of relevant information about the schooling of their children as well as a possibility to store individual preferences about information exchange and special requirements of meetings at school.

The long-term aim is to improve the teacher-parent communication and the possibilities for the parents to take active roles in their children's activities in school to improve learning.

The technical solution is mainly intended to be non-stigmatizing (equitable use) and flexible in use, according to the Universal Design principles [1], e.g. it is not parents' health or disability that will be stored, but their preferences on information and meetings. Also, the Universal Design principles simple and intuitive use and tolerance for error have been followed in the user trials to make sure the parents and teachers understand the functionality and how the use the prototype. The principle perceptible information will be focused on later in the project and size and space for approach and use is considered by the functionality itself of being able to store preferences for meetings at school. At a focus group the number of parents was reduced to four persons when a parent who are hard of hearing participated and rooms were selected to be accessible for persons using wheelchairs.

The concept of an inclusive digital school system is based on a model for an inclusive healthcare information system where patients can store their individual preferences about how to receive medical appointment notices from hospitals [2]. These are highly extended concepts compared to efforts to create adaptable web solutions to address diverse users and situations [3].

2. Target groups and iterative methods

The target groups are parents to pupils of ages 6-16, and to some extent teachers. The user requirement specification will include requirements from a variety of parents' situations (disabilities, different number of children, parents living together or separately). Parents have been recruited via schools and disability organizations.

The development of the user requirement specification is iterative, see Figure 1. So far, two focus groups (5+4 parents), one focus group (3 teachers), one idea generation workshop (4 parents) and two iterative test trials of a mid-fi digital prototype (6+5 parents and 11 teachers) have been held. The project started in September 2015 and will end in February 2017.

Digital prototypes were developed in order to demonstrate to the parents and teachers how we have understood their requirements and to trigger general as well as detailed feedback for improvements of the prototype. In total, three iterations are planned for the project, where the user requirement specification and the prototype become more and more detailed. Finally, the supplier of the current digital school system will make a demonstrator how they have interpreted the user requirement specification (also using input from the mid-fi digital prototype and the results of the user trials). This demonstrator will be tested by parents to make the final update of the user requirement specification, which along with the demonstrator will be the results from this project.
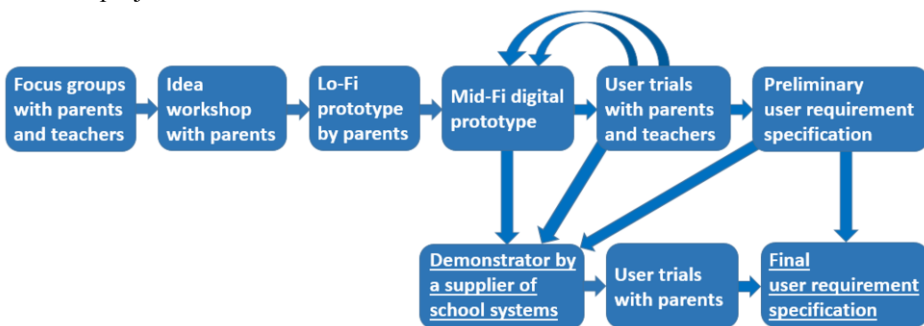
Figure 1. The iterative process to elicit parents' requirements for an inclusive digital school system.

The intention is that more municipalities and suppliers could use this user requirement specification to improve their digital school systems.

2.1. Focus groups with parents and teachers

Focus groups (2.5 hours each) were held in order to understand the situations of parents and teachers and their current use and experiences of different communication methods and digital school systems.

A new method of motivating every focus group participant to open up to speak and focus on explaining their current use and experiences was used. It included a whiteboard and several examples of communication methods written down on pieces of paper, such as e-mail, mobile phone text messages, phone calls, weekly newsletters, notes on papers in the children's school bags, the current digital school systems and meetings at school. Empty pieces of paper were also available.

The participants were asked to select one communication method at a time and position it at the whiteboard in an xy-diagram where "How hard it is to use" was marked along the x-axis and "How often it is used" was marked along the y-axis, see Figure 2. They were also asked to explain why they positioned the communication methods the way they did. This method is distinguished from usability analyses [4, 5], where the frequency of problems is measured instead of frequency of use and the severity of problems is measured instead of how hard the system is to use. Our aim was not to make any correct measurements, but to trigger communication in the focus group.

Figure 2. The participants positioned communication methods in an xy-diagram where "How hard it is to use" was marked along the x-axis and "How often it is used" was marked along the y-axis.

Suggested improvements to the current digital school systems and communication methods were also asked for and discussed to make the focus groups more interesting for the participants and to get some immediate requirements as input to the idea generation workshop.

2.2. Idea generation workshop with parents

An idea generation workshop (2.5 hours) with four parents was held in order to receive input to the first prototype to be used in the iterative development of the more and more detailed user requirement specification.

At the first part of the workshop the participants were divided into groups of two. The task was to specify what information they wanted to have when and how. Four A3 sheets for each group had been prepared and they included three columns each: "What information?", "When do you want to have it?" and "How do you want to have it?". Each of the four A3 sheets focused on a specific situation of information need for the parents: "Info about the past week", "Info about the coming week", "Info you want the

day before" and "Info you want more than one week in advance". The participants were asked to attach pieces of paper with examples of information, time data and communication methods to the three columns. Empty pieces of paper were also available. If the two participants in a group had different opinions, they were asked to attach two sheets of paper to show their diverse opinions. Examples of information were: Parent meetings, discussions on progress between teacher, parent and pupil, school outings, what my child has done in different subjects, home works, absence, themes children are going to work with, changes to the school schedule and things the child should bring to the school.

The second part of the workshop was carried out individually. At the second part of the workshop each of the participants made low-fi prototypes of how they wanted the top web pages of a digital school system to look, see Figure 3. They also had the opportunity to suggest how it should look like on a mobile phone and how the form should look like for entering their individual preferences about how to receive information from school and what they wanted teachers to know to make meetings at school as good as possible. Based on low-fi prototypes made by parents, a digital mid-fi prototype was made.

Figure 3. At the idea workshop parents made low-fi prototypes of how school system web pages and forms for entering individual preferences should look like.

2.3. User trials of the digital mid-fi prototype with parents and teachers

After an initial user trial (30 minutes) of the first mid-fi prototype, a second version of the mid-fi prototype was developed and tested (60 minutes) with parents and (30-60 minutes) with teachers, see Figure 4.

The digital mid-fi prototype was developed using the principle "Mobile First" (i.e. developing for mobile devices before desktop computers), which forces the designers to focus on the key tasks users want to accomplish [6, 7]. In many cases this principle will also increase the accessibility [8]. The interface of a mobile device was presented at a laptop screen.
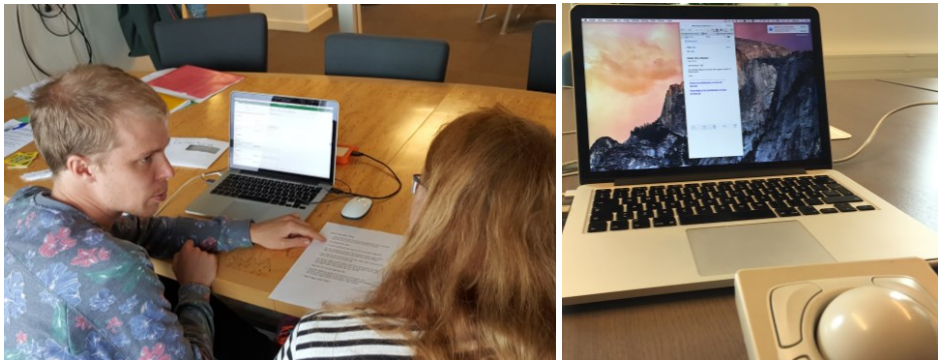
Figure 4. At the user trials, parents and teachers answered questions and interacted with the digital mid-fi prototype using their preferred input device, here a trackball.

An onboarding page was tested, where the parents are welcomed the first time they log in and have the possibility to make initial rough settings about which information to receive from school for each of three children, see Figure 5. The parent could choose between receiving little, more or as much as possible information, e.g. depending on how old, independent or mature each child is. Two versions of the onboarding page were tested, due to the results of the first user trial. In the second version the parent has more detailed control of selecting the default settings of which information to receive from school. Furthermore, the homework deadlines preference was moved to the "More" category as it was considered as important by the parents, see Figure 6. In both versions the parent could set the preferred communication method used by the school (e-mail, text message or a notification from a mobile app) and then continue with the next child or use the same settings for all children.
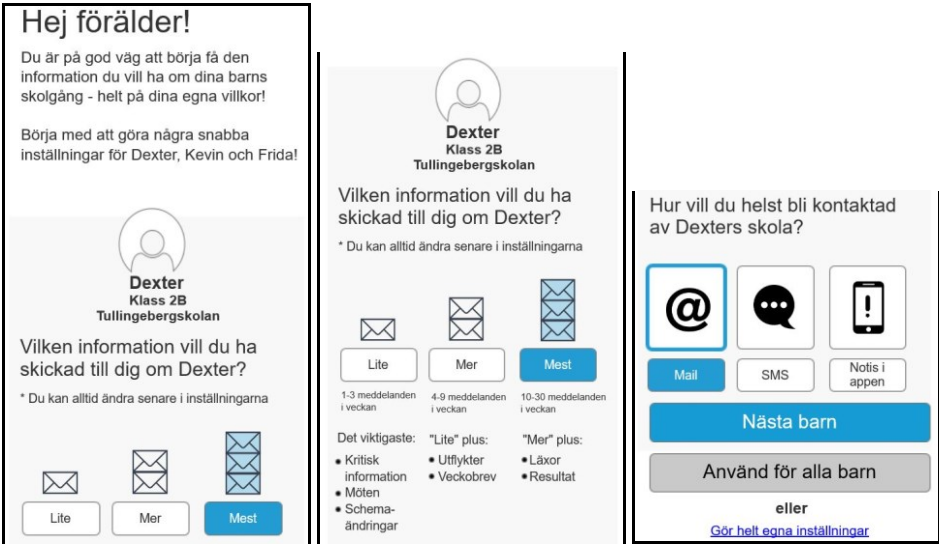

Figure 5. The onboarding page of the mid-fi digital prototype used at the second user trials. Here, the parent can make initial rough settings about which information to receive from school.

Figure 6. An alternative onboarding page of the mid-fi digital prototype used at the second user trials. Here, the parent has more control of selecting the default settings of which information to receive from school.

In the full settings page, it was possible to set preferences about food and allergies, meetings at school and how and when to receive messages and reminders, see Figure 7. For meetings at school the parent could select: No steps or high thresholds (max 2cm), hearing loop, sign language interpretation, speech-to-text real-time interpretation, meet me at the entrance, participating from a distance and interpreter for another language. There is also a text box for entering other preferences. For messages and reminders, the parent could select for each child how and when to receive reminders of school outings, meetings, homework deadlines and bringing sports clothes or lunch packets, how to receive messages about cancelled lectures and how and when to receive messages about absence from lectures (immediately or a summary after a day, week or month).

Figure 7. The onboarding page of the mid-fi digital prototype used at the second user trials.
In the two right images the preferences for meetings and reminders are expanded.

Teachers tested a message page where they can send information to the parents, see Figure 8. Teachers need to tag information when they enter it into the digital school system, to make it possible for the system to store calendar events and to be able to send reminders automatically. Types of messages are: Weekly newsletter, school outing, cancelled activity, change of lecture room, meeting, reminder and photos. This must be quick and easy for the teachers to do. They can select which classes or parents they want to send the message to and specify if it is a very important message, which will be sent to all parents regardless of their individual settings.

Figure 8. The message page. The headlines say: Subject, Message, Type of message and Send to. There is a check box for "Very important message" and a "Send" button.

3. Preliminary results

3.1. Results from focus groups and the idea generation workshop

Here are some preliminary results:

- It is troublesome for parents to have many systems to log in to.
- It is hard to find the information they are looking for.
- It is hard when different teachers are using the school systems in different ways.
- Some parents would like to have information sent to additional e-mail addresses.
- Parents lack information when their children are moving between parents living separately.
- Parents with several children sometimes get slightly different information for each child. It is hard for a parent to know if this is intentional or just a result of how different teachers express the information.

- Parents have very different wishes about what information they want when and how and for different children.
- When e-mail messages do not include the whole message from the teacher, the parents think they will look it up later in the school system, but they forget to do that.
- The visual and audio environment at meetings at school could be very disturbing for parents having attention difficulties or are hard of hearing.
- Some parents prefer speaking directly to teachers to get immediate feedback and being able to solve problems efficiently.
- At meetings at school, parents who are hard of hearing want to remind the teachers to repeat questions from other parents before answering them and also summarize any decisions after a discussion. Sitting around a table so you can see other parents' mouths when they speak is preferable.
- Parents feel worried about missing important information about school outings and lunch packets causing their child to suffer.
- Parents miss communication opportunities with teachers when they pick up their children from an after-school recreation center, instead of directly from school, because the staff at the center do not get information about what the children did in school.

3.2. Results from user trials of the mid-fi prototype

Here are some preliminary results:

- The parents reacted very positively on the onboarding page and the possibility to quickly and easily enter preferences after their first log in.
- The parents preferred the alternative onboarding page in Figure 7, where they have more control of selecting the default settings of which information to receive from school. However, some parents had difficulties understanding the connection between the three icons (little, more, as much as possible) and the eight checkboxes. This might be solved by slightly changing the layout.
- At the full settings page, it was hard for parents not in need of setting any preferences to guess what was under the link "Preferences about meetings". They thought about preferred times for meetings, food or booking of meetings, but after they had clicked on the link everyone understood. It was hard to find good wordings, although many were tested. However, a person using a powered wheelchair and always in need of informing the school before meetings, understood the link. This person needs to make several phone calls to administrators, teachers and janitors before every meeting at school.
- The preference "participating from a distance" was added after the first user trial and was appreciated very much by the parents in the second user trial.
- Many parents were worried about whether the teacher and the school really receives the information stored in their preferences. They wanted to get clear feedback, stopping them from contacting the teacher and school anyway.
- It is a problem for parents when teachers send weekly newsletters where important calendar events and reminders of bringing objects to school is included in the body text. The information is forgotten and hard for the parents to find later. There is a need to continue working with the teachers'

message page to find a simple way for teachers to tag information (dates, reminders etc.) in weekly newsletters.

In accordance with a previous study about a model for an inclusive health care system [2], a teacher pointed out that it was good that parents could specify certain preferences, e.g. participating from a distance, although the school currently could not fulfil their wishes, because that could be an important function to implement in the future. Another wish is that the staff could help some parents by entering preferences for them, e.g. when a parent calls the school to inform about specific needs.

4. Conclusions

The focus groups and the idea generation workshop fulfilled their purposes. They created open and focused discussions and gave the researchers good information about how different parents experience the digital school systems and the communication methods used by the teachers. The idea generation workshop resulted in a variety of preferences that were used as input to the development of the first prototype.

More work needs to be done on which preferences are categorized under which of the three alternatives (little, more, as much as possible) at the onboarding page. It must be clear to parents as well as teachers, because the intended functionality is based on that the categories are logical to the teachers so they tag information correctly.

Parents need to get clear feedback from teachers and school when they have entered or updated preferences, so they can trust that their preferences will be met.

Acknowledgements

Ethical considerations

The project has been approved by the regional ethics committee in Lund, Sweden. Informed consent has been obtained from all participants included in the study.

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