

Parents' views on their children and technology: Exploring the potential for adaptive interfaces to improve child-computer interactions

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ABSTRACT

The success of adaptive interfaces for adult targeted application is a strong motive to look at how children can benefit from this adaptation in their targeted applications and devices as well. But what are the devices and applications that children currently interact with? With that goal in mind we conducted an exploratory qualitative study to gather initial evidence on what types of applications and devices that children are using and what difficulties both the children and their parents face with respect to this technology and whether there is any role for adaptive interfaces.

GRAND project acronym PERUI

Keywords

Adaptive Interfaces, Child-Computer Interaction, Qualitative Evaluation.

1. INTRODUCTION

Given their ubiquity in society, computers are now used by a wide range of individuals. While computers used to be used mainly by adults in work-related settings, they are now commonly used for a variety of purposes and by a variety of ages, including young children. As such, there is a growing body of work focusing on how to design better child-computer interactions. Examples of prior work on the intersection of HCI and children includes children's interaction with tangible interfaces [e.g., 11, 14], investigating children's preferences (e.g., font size, type and background color) in a user interface design [12], and even using technology to facilitate remote communication between older adults and their grandchildren [7].

One aspect of child-computer interaction that has received much less attention to date is how to adapt interactions to children's individual usage patterns and difficulties. Instead, the majority of work on designing adaptive interfaces has focused on adults. Prior work in this space has shown that when properly designed, intelligent help systems can ease the process of finding new information related to the task performed by the user [e.g., 8, 9]; or that interfaces that change their layout and elements to the needs of the user or context can improve efficiency [e.g., 2, 3]. Despite these potential benefits, we note that outside of tailoring educational material [e.g., 1, 13], rarely has work on adaptive interfaces focused on children.

As a first step towards understanding the role of adaptive interfaces for children, we conducted an exploratory qualitative study with 12 families with children ages 4-10. The goal of our study was to gather initial evidence on what types of applications and devices children are using and what difficulties both the children and their parents face with respect to this technology.

While our initial goal was to determine the most fruitful avenues of future work for designing adaptive interfaces for children, our results also point to challenges parents face with maintaining control of content and in defining and adhering to what they consider to be acceptable uses of technology.

The remainder of the paper is structured as follows. We begin by reviewing related work. This is followed by a description of our study method and findings. Based on these findings, we then describe promising areas of future work.

2. RELATED WORK

Looking into the literature on adaptive interfaces and children, we find that it mainly focuses on adapting educational material to children's needs. The first example for adapting educational content is adapting educational games. Conati and Manske [1] embedded an agent into an educational game that provides adaptive feedback with the purpose of increasing the child's engagement and learning effectiveness. Tsai *et al.* [18] tackled the same problem but from a different angle; instead of having the educational game provide adaptive feedback, the game would change its level based on how difficult the child finds it to be (based on facial expression recognition).

A second example of adapting educational material is tailoring a reading tutor, which Mostow *et al.* [10] did. They conducted a study in which they analyzed the use of a reading tutor, and they were able to provide a set of guidelines for the design of an adaptive reading tutor that would help decrease the time wasted in a tutoring session.

Other than tailoring educational content, there has been little work on finding other useful implementations for adaptive interfaces for children. One exception focused on children's interaction in the context of dialoguing with computers [6]. The goal of this research was to design an adaptive interface that accommodates the age and gender differences among children. This work conducted an experiment to find the effect of age and gender differences in the interaction scenarios that required dialoguing with the computer. Based on the results of this experiment, the work presented a set of guidelines on the design of usable interfaces, taking the age and gender factors into account. These guidelines, however, mostly apply to the specific context of dialoguing with computers.

3. METHOD

Looking at the body of work on adaptive interfaces and children, we find that adaptive interfaces for children have proven to be useful in the specific domains in which they were applied, which raises the question of what else could they be applied to. To better understand the different types of applications and aspects of technology that children interact with, and the challenges that parents and children face throughout this interaction we conducted

an exploratory qualitative study with families of young children. Specifically, we conducted a series of semi-structured interviews with parents (described in table 1) from 12 families who had one or more children in the 4-10 year-old age group. We choose parents as our participants as opposed to children because parents would be able to articulate both their views as well as their children's views of technology. Participants were recruited through snowball sampling, beginning with the authors' personal contacts, and through advertisements placed throughout the university. When possible, interviews took place at the participant's home where photos and notes could be taken about the environment. The interviews lasted 20-45 minutes; the participants received a \$10 gift card as an honorarium for their participation. Data was collected via audio recordings, which were later transcribed.

Table 1. Parent's occupation and their children's age/gender

Parent	Occupation	Children's age/gender
P1	Day care teacher	Boy: 5 years
P2	Grad student	Boy: 8 years, 10 years
P3	University support staff	Girl: 5 years Boy: 8 years
P4	Day care teacher	Girl: 4.5 years Boy: 9 years
P5	Stay at home parent	Girl: 10 years Boy: 7 years
P6	Grad student	Girl: 8 years
P7	Unreported	Boy: 8 years, 10 years
P8	Day care teacher	Girl: 7 years
P9	Day care teacher	Boy: 9 years
P10	Grad student	Boy: 7 years
P11	University support staff	Girl: 5 years
P12	University professor	Girl: 10 years Boy: 8 years

3.1 Interview Questions and Data Analysis

During the interviews, we asked the participants to describe the usual interaction of their children with technology through the day. As they described, we probed about the following:

- What are the different types of applications and aspects of technology children interact with?
- What are the difficulties that the children face throughout this interaction?
- What are the parents' opinions in the technology their children are using and interacting with?

To ground the data and assist with recall, we asked participants to focus on specific instances of technology use whenever possible.

Data from the interview transcripts were analyzed using affinity diagramming and a bottom-up inductive approach. From these affinity diagrams, we extracted commonalities and themes relating to children's technology use and parents' perceptions of technology.

4. FINDINGS

Our interviews show that there are many categories of devices that children use, varying from devices designed for kids (e.g.

Leapster), to dedicated gaming platforms (DS, Wii, Xbox), multi-purpose devices (tablets, laptops, desktops) and even smart phones and iPods. Most of the parents report that their children need little to no help with learning and operating the different devices; one common problem which most of the children had was their inability to spell properly, so they needed their parents' help with, for example, online search. Creating simpler search interfaces for children has been the target of many studies and experiments [e.g., 4, 5]; however, these interfaces have not been deployed for commercial use. While we had originally hoped to gain information on the potential for adaptive interfaces for children, the results of our interviews showed that control was a major concern that parents exhibited. We discuss the different strategies the parents use to handle this control issue. We also summarize the guidelines of what parents consider acceptable use of technology.

4.1 Control

Parents worry about the content their children view and whether it is appropriate for them or not, so they developed several strategies to protect their children, which fall into 3 major categories. We discuss each of these categories below.

4.1.1 Physical Control Strategy

One common strategy was for parents to physically control the content their children were viewing. For this the parents have to be in the same vicinity as their children to monitor their children's use of the different devices.

He doesn't use the laptop alone, never! – P10

I don't like them playing in the bedroom too much, because then they can't really be monitored. So I prefer them playing when they are with us. – P2

They have a laptop but they only use it at the dining room table, so we're always around and usually we at least know what they are doing if not what site exactly they are on. – P12

4.1.2 Content Filtering Strategy

In this case, the parents pre-filter the content their children are viewing to make sure it is appropriate.

If they ask to go on a website we haven't heard of, we'll sit with them and check it out a little bit and make sure that we know something about it before they go on it. – P12

Anything new, I have to see it first, and I have the favourite bar. When I find something good and safe, I add it for them in that bar. So when they want to play something, I told them if it's in the favourite bar ok go ahead, if it's not you have to tell me first. – P5

You choose the songs and games you put inside [iPod] so you are very confident they are suitable and this is what you want them to hear. – P5

4.1.3 Passwords Strategy

Some parents go for additional security measures by using passwords on the computer or internet connection to make sure they are aware of when their children are using the devices and what is it that they are doing.

On the computer here we have a password, so before he goes he needs to ask me to use it or not. And before I give him the password I ask him what are you going to do? – P4

It turned out that not many parents are using browsers' parental control settings, either because it is difficult to use, or because the device is a shared one and those settings limit the other users.

I know there are those parental control things, but it's not that easy and it takes time to go and apply these settings – P5

We have that [browser settings] but not very high, it's our computer, my wife and I, and we let our daughter play – P6

Other parents would like to have an extra feature of being able to lock their children's devices into certain modes to ensure their children are only using specific aspects of the devices.

I'd like it if we could lock it [iPad] to just her page that has her stuff and to get to other pages you have to write a password or something. – P11

Regardless of which strategy was used, parents mentioned the management overhead and gave signs that they expect that their children will eventually need more freedom.

[The laptop] is too multifunctional to let them loose with it, it has to be where you're monitoring it and that's a lot of extra work to do. – P2

I'm in control with passwords and stuff, but eventually they're going to have their own, they're going to want to go on the computer and I can't sit beside them all the time. – P3

Another aspect of parental concern related to control is privacy. Parents' general approach was to teach their children about what is appropriate in the cyberspace; however some parents still chose to monitor their children as well.

They need to be aware that these virtual spaces are really public spaces and that they are not as imaginary as they appear. That what is going on there is a form of reality and so that's something that we have to teach them. – P2

He has one [Facebook account] that he uses with his friends at school but it's a closed one so no one can look him up and I totally monitor it. Like you, for example, couldn't look at his pictures and any of that stuff. You can request to be friends, but that's it. – P7

4.2 Acceptable Use of Technology

Parents play the role of technology gatekeepers for their children, it is only through them and what they deem appropriate that the children get access to the different technology artifacts. Parents had set their own individual measures for what constitutes an acceptable use of technology, whether it was time limit for technology use per day, using technology for education versus using it for fun or even allowing this technology interaction as a reward and declining it as a punishment.

4.2.1 Educational Purposes

Using the different technology artifacts for educational purposes was on the top of many parents' lists as an acceptable use of technology, and some even considered it the only acceptable use of technology.

He uses computer for his religious lessons...it is not about fun and playing games. - P1

The most direct educational uses of technology that we observed were through math and vocabulary games. However, most of the children seem to be rejecting this kind of use, only focusing on using the technology for pure fun.

I do like it when I'm going through [iPhone] apps with her and I'm like "oh look at this, you could learn letters or practice writing" I try to push those but she doesn't like it, she wants to bake [iPhone game] and do those things. – P3

Another educational aspect that parents welcomed the technology use for was indirect education, which helps the children learn logical skills or encourages creativity.

It is a building game [Mine Craft] so I can't be too upset about it. It requires a lot of imagination, intuitivity and creativity so I kind of feel better about them playing that versus a lot of other games that maybe wouldn't be as creative. – P2

There is a voice recorder [DS] and you can play with the sounds and edit the sounds on it and there is a camera too, you can take pictures and do weird things, add things to the picture and distort them, so when they are on the DS, they are not just playing a game, half the time at least it's them fooling around manipulating images and sounds and stuff. – P7

4.2.2 Time Limitations

Our interviews showed that most of the parents had set a time limit for their children's daily technology use. The parents were concerned that their children's prolonged use of the technology artifacts could affect their physical and social well-being.

Although the movie is at least one hour, but we want him to stop around 30 minutes, because that's good for his eyes...that's the maximum time for kids at his age to look far away to let their eyes rest. – P10

My one dislike [iPod] is that the volume on it is very loud, even when you have headphones in, I can hear through the headphones, and I worry about their hearing. - P12

When it's the nice days then I'm like no you need to get out of the house and he wants to play [iPod/DS], so it can be a bit of a fight. – P3

Kids in this age, especially 5-6, they need some socialization, I want him to go outside to park, play with other kids, sports, bicycles and all that stuff. Maybe that's why [we are not a very technology oriented family]. – P1

In some cases parents found that they were having difficulties setting a time limit for their children's use, so they either opted for not letting the children have their own devices or transferring the property of a child's device and making it a family device.

When he has his own [DS], it'd be hard to take it from him he'll be all the day just playing and not focusing on anything so we decided not to buy one. – P5

At the beginning we got the iPad for him as present and then because he spend so much time on iPad, so we said we, both his daddy and I, have to use it. Just wanting to reduce the time he spends on it. – P10

4.2.3 Age

A factor that parents took into consideration when getting new devices was their children's age; many parents tend to delay getting their children their own devices until they feel there is a strong need for it or until their children learn how to control their use of these devices.

I don't know, maybe around 10, when he knows what he needs to do. Now at this moment I think he is still in the stage that parents should guide him, but afterwards if he can control himself to say what I have to do first and what last, then maybe [introduce new devices]. – P10

I think that it's not the age for that [having personal devices], we think after 8 she can have some, but all that stuff before, we think it's not appropriate... I think they are in a learning level so I don't think that it's a good idea to give an iPod or cell phone and they are always with these things and they should be learning a lot of things. – P6

4.2.4 Reward vs. Punishment

Parents have also noticed their children's strong attachment to the use of technology and have leveraged this for rewarding or punishing them.

The first form of punishment is the electronics taken away... before it was no TV and then we figured out no, no electronics. – P7

If they are playing and I was trying to talk to them and they weren't listening because they were engrossed in a game, Wii, DS or even online, if they weren't listening to me then they would be in trouble and won't be allowed to use that again. – P12

During the school year that was kind of like his down time, we'd get home and he'd go down and play for about half an hour until supper is ready. – P3

5. NEXT STEP

With content control being the dominant concern that all parents exhibited and the smart phones being the device most commonly used, our proposed next step of interest will be to pursue the idea of having an intelligent, collaborative (parent-child) content filtering application, in the context of smart-phone apps. Such an application would have three initial targets; the first is to partially automate the content filtering done by the parents, the second is to give children partial freedom in their choices instead of completely restricting (perhaps by making new apps installation a joint process between parents and children); and the third is to improve future filtering through considering the apps that the parents rejected.

Given the nature of devices and applications that the children use, children did not seem to currently be using adaptive interfaces. Nevertheless, one possible future work is adapting toolbars and menus of applications such as word processor or power point to the usage patterns of older children (8-10 years), who use these applications as a school requirement

6. SUMMARY

In this paper we presented the results from an exploratory qualitative study with the purpose of learning about the usage of technology of children in the 4-10 year-old age group. Our findings emphasize the importance that parents place on control mechanisms and highlighted some of the dynamic and competing aspects of parental concerns and goals. We believe that such information can be useful for designers of children-centered technology; by addressing the parents' concerns when designing children-centered technology, the designers would be ensuring that the children will be granted access to this technology. Moving forward, we will continue this direction by extending the scope of our investigation through broader studies, developing novel control paradigms and interfaces that match the needs outlined in this paper, and through study of such interfaces further solidifying design guidelines for the development of children-centered interfaces.

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