Under my Pillow – Designing Security for Children’s Special Things

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ABSTRACT

This paper describes a novel design activity that was used to gather insights into security requirements for a mobile application for children. The general aim of the study was to understand how to design for security in an application for children rather than to specifically generate design solutions. To gather this information, a novel design activity, referred to here as Participatory Analogy, was devised. The study is described and design solutions that emerged following analysis of the children’s contributions are presented.

Author Keywords

Security, Privacy, Children. Child Computer Interaction, Theory, Personal Data

ACM Classification Keywords

H 5.2 [User Interfaces]: Prototyping, Screen Design, User-Centred Design

INTRODUCTION

The context of this work is a recently begun EU project called UMSIC. The goal of UMSIC is to use a mobile device (the JamMo) and develop the software for that device to promote learning of, and play with, music to foster social inclusion with children aged between 4 and 15. The JamMo is intended to be used as a stand-alone or networked device and can be used as a personal technology or as a shared technology, for instance in a classroom where the school may have a set number of these devices for children to use. As the device is being designed for such a large age group, the applications are being tailored to different groups of children (3 – 5), (6 – 10), (11 – 15) and so the children will normally be presented with an interface that matches their age. In addition, the JamMo is being designed to operate in three European languages, English, German and Finnish, and so the child should load a version of the software that is in a language that most closely suits his or her needs.

The intention of the JamMo is to enable children to create, play, and edit music and to share this with other JamMo users in either closed or open networks of users. When children create songs they are saved in the individual child’s area and can then be accessed by other children.

The requirements for networked use, the sharing of files and partial customization of the application according to age and location all indicate a need for some password / login / security systems. One of the aims for the JamMo is that it will be as text free as possible so that it can be used by newly immigrant children in countries where the language is initially unfamiliar and so the design of these security systems was considered to be a significant challenge for the design team.

User Centered Security

For a long time, security for systems was all about encryption and hardware and was the realm of software engineers and programmers. In recent times, the human aspect of security – referred to as user- centered security [7] has become a research area of its own.

Key commentators on the need to understand what people really do with security systems have firmly stated the need to understand the user: Dourish et al write ‘*a major obstacle to the development of more effective security strategies is that these systems often match poorly to the ways in which people need to make use of them*’ [1]. For instance, as people find it hard to remember passwords they find ‘work arounds’ like using the ‘forgot my password’ facility on web sites and writing down their passwords [3].

In all aspects of computer and internet security, people need strategies that they can deal with. Microsoft employee Jesper Johansson said in a keynote to the 2005 AssCERT conference (cited in [8]) that ‘*companies should not ban employees from writing down their passwords, because such bans force people to use the same weak password on many systems*’.

Security of computer systems is closely associated with the use and sharing of personal data. In many instances pieces of personal data are used to ‘unlock’ systems or deliver forgotten passwords. Many systems use a three-key approach to security that is based on:

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- What you know (self created password)
- What you have (client given code)
- What you are (personal questions)

Personal questions in this context rely on the question being about something that others cannot find out. Recent studies have shown that, as people share their information with others, like, for instance, on Facebook, breaking into people's spaces via their personal data is a more significant threat [4]

Children and Security

Children are no different than adults when it comes to security on computer systems. Indeed, their difficulties can be compounded by their abilities and their attitudes.

In a recent study children were asked to write about themselves and then comment on to whom this personal information should be given. They unequivocally suggested that information should not be given to strangers but their understanding of who constituted a stranger was confused. The researcher who had come to the school classroom, who had not met the children before, was NOT considered a stranger as she was in the 'safe place' that is the school environment

Children can have a limited sense of the need to keep things to themselves; in a different instance, one child, having finished her set work, asked if she could go onto ClubPenguin¹ and having gone to the site, and come to the point of inputting her password, called across the room 'How do you spell Quaver²? My password is Quaver – how do you spell it?'

Children Designing their own Security

In the interaction design community it has become a common practice to include children in design projects [2] either simply as users (who validate the researchers ideas) or, more commonly, as informants [6] who provide essential information to the design team that could not easily otherwise be gathered.

Taking this latter view and realizing, as pointed out by Singh et. al [7] that to design security systems for children would require an understanding of their own specific contexts the authors decided to design a study to gather ideas from children. There were several choices available, children could be directly asked about what they did about security and about what they understood about these things (shown in [5] to be difficult), children could be watched carrying out tasks (in which case they would probably modify their behaviors), or, and this was the approach used, more imagination could be brought into the design space in order to better understand the context within which children thought about the safety and security of their special things.

THE STUDY

The study was designed to answer the question – how do children keep their special things safe? The findings, from this study would then be used to consider, from a design angle, how children's products could be designed to ensure that children understood how to keep special digital content, for instance passwords and personal data, safe and secure.

Participatory Analogy

A new method, referred to here on in as Participatory Analogy, was devised to gather ideas about the context from children in a way that they could contribute ideas to a relatively complex space. Rather than ask about internet security and the way children stored their passwords, the plan was to abstract to items and behaviors that were related to, but not tightly associated with, security and computing.

This method required the authors to identify a suitable analogy for passwords and personal data and a suitable analogy for security of these things. The solution that was chosen was to ask children to identify their special things and then examine how they kept these special things safe. It was decided to carry out this study using pictures rather than words as children are generally better able to express themselves, and their ideas, in this way. Using pictures also introduced a level of fun into the activity and took away any anxieties that would normally have been associated with having to spell unfamiliar words.

Design

The study was carried out in two different UK schools with children aged 8 and 9. In each school, all the children who were in the class on the day took part. Children generally came to the study in groups (of 4 – 8 children), sat at a large table and were facilitated by a single researcher who attended all the sessions. In the event, 3 children were unable to complete the task as they did not understand what was being asked, 3 children who began the task did not complete the second part of the task.

Procedure

The study was arranged in four stages as follows:

1. Introduction to the notion of special things,
2. Chance for each child to communicate five special things,
3. Selection from this set of the single 'most special' thing,
4. Discussion with the child (individually) about how that 'most special thing' was normally, or could be, kept safe.

Altogether, the four stages took around 20 minutes to complete and the children moved, in their own time, from one to the next.

Stage 1 – the activity was introduced by the researcher giving to each child a 'My Special Things' booklet. This

¹ A social networking site for children - <http://www.clubpenguin.com/>

² A maize and corn snack sold in the UK, popular with children

was simply a piece of A4 paper folded in the middle to form a four sided booklet. On the front of this booklet the words ‘My Special Things’ was already printed and there was a space for the child’s name and age. The researcher introduced the topic as follows ‘Hi there, in this activity I want you to think about special things – we are doing this to help us design an application for you, and for other children so what you do here is important. I want you to imagine that you have gone home from school today and your parents have told you that tomorrow you are moving house to the moon! They tell you that you can only take five special things! In this booklet – which is a little bit secret, I want you to draw the five most special things you would take to the moon with you’.

Stage 2. After this intro, the children were given pencils – they filled in their names and started to draw things. Children who were struggling to get started were given some encouragement by the researcher but no ideas were given.

Stage 3. The children were instructed to individually tell the researcher when they had finished. As a child finished, he or she told the researcher who then sat down with the individual child and talked through the pictures – labeling any ambiguous pictures (for later clarity). The researcher then told the child to choose their most important thing and mark it with a circle or a star.

Stage 4. With the researcher still being one on one with the child, the child was asked ‘So this special thing (generally named) – how do you, or how would you keep this safe?’ This was posed as a question and some help in understanding it was given to some of the children – especially the younger ones. The child answered verbally and the answers given were written, by the researcher, on the child’s booklet.

Analysis

For this study, of interest was the ‘safety’ of the ‘most special thing’ and so the only data that was analysed was:

A. The special item / thing chosen

B. The way this special item / thing was kept safe

For item A, the lead researcher created a list of items and then allocated these to groups as appropriate. For item B, these responses were also grouped as appropriate. The items that were initially identified as special, but not chosen, were considered during post hoc analysis.

RESULTS

Almost all the children found the activity straightforward and they seemed to enjoy what they were doing. Only 3 children out of 43 failed to draw the five items required. Two examples of completed sheets are shown in Figure 1.

When it came time to choose a most special item, many children agonized over which item to select as their most special.

Figure 1 - Examples from the Children's booklets

Collective	Freq.	Example	Type
Game console	10	Nintendo DS, PSP	Exp
Real person	7	Mum, Teacher, Baby sister	Emo
Cuddly Toy	7	Teddy, Zebra	Emo
Pet	4	Fish, Dog	Emo
Irreplaceable keepsake	4	Particular photo	Emo
Replaceable special thing	3	Video, Football	Exp
Collection	2	Crazy bones, coins	Emo/Exp
Essential item	1	Toilet	Exp
Valuable item	1	Money	Exp
Thought	1	Minger	Emo

Table 1 - The special things chosen by the children

A couple of children could not make a decision on this - but overall the children managed to complete the task. The items chosen as special were very varied – in summary the frequencies of the different types of thing selected are shown in Table 1.

From this data it can be seen that in most cases the children had a reasonable understanding of what was being asked for. For later analysis the special items were broadly categorized into two classes: emotional (Emo) attachments, and experiential (Exp) ones.

It could be considered that the children chose some items because they had been ‘told’ they were special rather than because they really thought they were special but this was not especially evidenced especially in the items ‘not selected’ for instance, six children chose their cuddly toys over their parents, friends or family, two chose games consoles over real animals and three chose their games consoles over their parents! One child chose a video (clearly replaceable) over his parents! Many children didn’t include their family or friends in their initial five choices but it might be that they didn’t consider them as

things so didn't include them so no conclusions can be made from this.

The safe places chosen by the children were equally varied. To relate the special things with the special places, the most commonly occurring categories from Table 1 (35 items) were considered and a summary made of the places where they were put. This is given in table 2 – note that 4 children could not think where to put their chosen item and so only 31 responses are recorded here.

Category	Frequency		Example
	Emo	Exp	
Close to self	7	0	Hold, keep close
Bed / bedroom	3	0	Under bed, under pillow, on bed
Containers	1	7	Cases
Safe place	6	3	Own home / school / pet's home
Hiding places	1	3	Crack in wall

Table 2 - Locations for special things

In general, emotional things were secreted in emotionally close domains (next to heart, in bedroom) whilst experiential ones were put away (locked in boxes or cupboards).

Extrapolating from the data

The aim of the study was to generate theory that could be used in design to assist children in keeping their own personal data, and their passwords safe but also to inform the design of instructional material for children based on the same topics.

To carry out this extrapolation it was necessary to make a link between the items that were chosen as special and the places chosen for their safety, and the more general concepts of personal data and passwords.

In the adult world a password is an access code to something the adult wishes to access. This might be a bank account, it might be a social networking site or it might be a game. The password that the adult chooses generally has some association to the adult's world but it is probably replaceable and of its own, without context, it has little value.

The game consoles chosen by the children as special are similar in some ways to passwords. In no cases did the child specify a game, which is the experience that the games console unlocks; it was the device that mattered as this was the route to the experience. The console could be replaced (even if the child would not believe this would be the case). In seeing how the children kept the games consoles safe it was interesting to note that in every case the idea was that the console went in a box or in a locked box or drawer.

The other aspect of interest in our present study is personal data. Personal data is clearly specific to the individual. Two individuals will seldom have the same personal data and as adults, we are very wary about sharing this data and we tend to be cautious about who we give this data to.

The special irreplaceable things, like the teddies, and the family members might provide a good metaphor for understanding or for communicating the importance of keeping personal data safe. In most cases the children chose to keep these things safe by keeping them close to them or by having them remain in their safe places (like the house or the bedroom).

DESIGNING FOR SAFE KEEPING OF PASSWORDS AND PERSONAL DATA

For the JamMo, an essential requirement is that any solution designed for it is useful in the context in which it will be used. Thus, as it is a small portable device, the options of physical solutions for safe keeping of special data are not really possible. Thus, the uses of physical passcards and keys, locked physical boxes, codes in address books and so on are not considered as it is assumed that these would not be available.

Keeping my Passwords Safe

The scenario here is that the child creates a password and then might not know how to record it or make it memorable. It seems that a good place to hide passwords might be in cupboards or boxes.

Figure 1 - Hiding passwords and password clues

A design solution might be that children make their passwords (which may be numbers, pictures or images and is the subject of a further study), and then hide clues in cupboards and boxes. Additional security might require the child to only open a limited number of things in his or her search for the lost item.

Giving out Personal Data

The scenario here is that children might enter their names, or their ages, or other personal information into the JamMo, and might not realize where this is going. In this instance, the child needs to be alerted as to what he or she is doing and informed about the connectivity of the

device in order to make a decision whether or not to proceed. The visualization of a special item going away from the child can assist.

Figure 2 - How far do I want my personal things to go

If the analogy of moving from person, to bed (room) to home and then to outside is used - in the same way that children keep their teddies and special things close and in safe places, then children might understand better the necessity to treat their personal data with care and only entrust it to certain people / places. In addition, we could design alerts that might show the data (the teddy in this case) getting colder and colder as he travels away from the child towards the North Pole.

DISCUSSION

Having carried out the study, and generated designs for the product, it is interesting to reflect on the process of moving from the abstract ideas of the children to the suggested designs for the product.

One caveat that needs to be placed on this study is the need to beware of drawing too strong an analogy between adult security concerns and those of children. For example, in consideration of passwords, the notion that a password unlocks an experience but is intrinsically meaningless may not hold for children in the same way. Their analogous object may be a games console, but it may be a fear of their parents’ reaction if it gets broken or lost that gives it a place of ‘specialness’, alternatively the console might be a treasured present from a grandparent, and be valued for that specific reason. Moreover, informal conversations with adults have revealed that passwords can indeed have some personal emotional investment in them – sometimes for complex reasons,

sometimes because of the images and stories that are used to generate and memorise them – initials of first dog followed by registration number of the sporty red car, and so on.

With this caveat however, it appears that the method employed in this study, of using metaphor and analogy was effective in deriving suitable design solutions. Although the solutions have not yet been specifically evaluated, it is the authors’ belief that these represent strong ideas that have flexibility and merit.

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