Designing a mobile phone for children

Creating personas of young mobile phone users and their parents with a means-end study

A study of children and parents values

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Whenever an IT- Artefact is used an interaction between it and its user occurs. In order to make that interaction as smooth and pleasant as possible the designers must understand how the user wants to use the artefact and why. Reviewing the existing market for mobile phone for children we suspected that the designers did not have a clear idea of the intended user's need. We therefore aimed our thesis at delivering knowledge regarding the needs related to a mobile phone for children. We conducted an empirical means-end study in order to gain insight of what the user experience goals and underlying needs are for children aged 7-9 years and their parents. The study included one-to-one interviews with both children and parents. Prior to the interviews we reviewed the existing market and created initial hierarchical value maps in order to visualize what was missing in the existing phones and give us a basis for the interviews. During our research we used Personas as a representation of our target group. These were created at the very beginning of our work and where filled with facts as it progressed. The result of our study shows that special care regarding the functionality and cognition must be taken. Our Personas indicate that children have different needs compared to that of adults and that these needs are influenced by their cognitive abilities. Hopefully our Personas can stand as a model within the continued work of designing a mobile phone for children.
Preface

The authors wish to thank our instructor Victor Kaptelinin for his much appreciated help and encouragement throughout the process of writing this thesis. We would also like to thank Simon Lessing at Sony Ericsson for making the collaboration as smooth as possible. Last but not least, we extend our thanks to the children and parents we have had the opportunity to meet. You have been very obliging and made our work both rewarding and amusing.
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1 Introduction

1.1 Background

Reviewing recent studies of mobile phone-usage they show that a great deal of children between 7-9 years owns a mobile phone. A study conducted this year in Great Britain (The Daily Telegraph, 2009) indicated that more than a third of children aged 8 years have a mobile phone. Simultaneously, a study made in Sweden (Svenska Dagbladet, 2008) showed that a majority of children in primary school have a mobile phone.

Children are evidently presented with information technology at an increasingly early age. Parents of today must not only teach children how to use different artefacts of IT, they must also adopt and merge their values into the technology. This is since children, limiting us to ages 7-9 in this essay, are still under the supervision of their parents (and other adults) and are yet to develop their social skills to a full (Papert, 1999). In extension, this means that children aged 7-9 lacks the judgment needed in order to act safe and correctly judge people's true intentions. This was a problem that got much attention when Internet made its appearance into children's life (Barn & Internet 2008). At this time and age a comparison between the computer and mobile phone becomes valid since today’s phones can be used to attain and exchange information in a similar way as with a computer. But unlike the computer, with which the parent can easier supervise the use, children can use the phone outside the boundaries of parent’s control. This implies that some restrictions of the phone's functionality should be taken under consideration.

Whether or not parents choose to provide their child with a phone there is a demand to be met and today we can observe how the existing mobile phones do so in an inadequate manner. This problem was initially raised when conducting an interview with Sony Ericsson (Personal Communication, 14 April 2009), and later on we found support in form of reviews indicating that the even though developers had made a phone for children it wasn't fully suited for their needs (Consumersearch, 2008). We could relate these findings to for instance Vygotsky (Gelderblom & Kotzé, 2008); "the designers must know the cultural context of their intended users and also acknowledge their own context and how that may consciously or subconsciously influence their design practice". This being said, it indicates that designers cannot just simply apply standard functionality and design to a mobile phone for children; they have different perspective and reference compared to those of adults. Furthermore it's been said that children go through different phases of cognitive development (Gelderblom & Kotzé, 2008). Our findings signal that there is an existing and emerging market and, together with the mentioned issues, it gives us incentives to further investigate what needs are important when designing a mobile phone for kids. Also, our thesis have been conducted in collaboration with Sony Ericsson (SE), overviewing their product portfolio we find that there is a gap related to the raised problem, there’s no phone which is expressed as being especially suited for children.

All in all we recognize three separate needs to be met, first, that of the parent's wish to in some way control and regulate the use, secondly the children's needs and thirdly that of
adoption the cognitive-related functionality making it age-appropriate. These aims make for a possibly contradictory result. One way of solving that issue would be to find an interval where the kids are old enough to understand the phone from a usability perspective and young enough to accept some sort of limitation of functionality.

Our question in this thesis is:

*What needs are important when designing a mobile phone for children?*

Although children’s use of mobile phones has been increasing drastically in recent years, we have found a tendency towards that the designers don’t have a clear picture of what the target group wants from their mobile phone. Reviewing the current range of mobile phones designed with children in mind there are roughly a dozen alternatives presenting quite a similar line of features and design. Revising the big players on the Swedish market we find no more than a couple. At a glance a majority of the alternatives gives the impression of more being a toy than a phone - is this preferred design based on what children want or on what the designers think children want? And how do we balance age and design? In designing a mobile phone an investigation of the needs of the users will allow the designers to focus on the functionality that is desired by children and their parents.

Furthermore, the desired functionality should be implemented in a way that accommodates children’s cognitive abilities. This is also an area where we think that children’s mobile phones of today might be lacking. Although much research focuses on children’s cognitive development (Piaget 1977, Vygotsky 1978), less is concerned with children’s cognition in relation to the design of mobile phones. The goal of a successful design must not only be that the preferred functionality is available, but also that the functionality is implemented in a way that children understand.

1.2 Aim

As a consequence of our background our aim is to conduct an empirical study that should present us with the needs and requirements of children and their parents related to mobile phone usage. Thus, we’ll be reviewing the current market and create Personas based on a means-end study. In extension these will give us a couple of user experience goals for both children and parents. In doing this, we hope to contribute to the current research with knowledge regarding the underlying needs that links to children’s use of mobile phones. Also, we hope to give a hint as for the connection between cognitive developments and how that affects a mobile phone's design. The results will hopefully also provide SE with an indication as to what issues must be taken under consideration when designing a mobile phone for children and also give them a basis for the continued work with specifying the design and functionality.

1.3 Scope

Because we do this research in collaboration with SE, we have decided not to focus on the physical design of the mobile phone. Firstly, we feel that our area of expertise lies more in the
fields of needs- interaction- and cognition analysis, and secondly we believe that SE will do a better job designing the phone. These limitations of the scope will allow us to do a more substantial research in the areas we have decided to focus on.

Due to the great variation in the development of children (Piaget 1977), we decided to limit our target group to children in the age of seven to nine years. The age of seven was decided partially by SE and also due to the profound changes that appear in children's lives when they start school. They become more mobile and their amount of social interaction increase. The upper limit of nine years was decided because in that age the child begins to have a desire to imitate adults, which also means that they want the same type of mobile phones. Thus, there's an increasing risk that they are not interested in a mobile phone that is designed for children. In our selection of the age span we found support in Piaget's theory of cognition (Gelderblom & Kotzé, 2008). At the age of 6 to 12 years children's cognitive development is in the concrete operational stage. In this stage children begin to understand objects that are not physically present, and they can also use symbols to represent objects. Furthermore, they can use language to communicate in an effective way. These are basic skills needed to be able to handle a digital artefact such as the mobile phone.

Our scope is also influenced by Alan Cooper's (1999) theory that the probability for a product to become successful is greatly increased when the product is designed to fit the demands of a smaller target group. If the designers try to please too broad of a target group, the product is less likely to make a user ecstatic about the product. If the designers have a narrower scope, the likelihood of making that smaller target group ecstatic about the product increases. One of the benefits of a target group, which is really pleased with their product, is also that they are more likely to repurchase, and that they are likely to promote the product by word of mouth.

We will have the mindset that a mobile phone for children is demanded and should be designed, rather than to do a study on whether a child should have a mobile phone or not. We will focus on the design process, instead of on ethical concerns.

2. Method

As with any work of science, it's utterly important that we can prove and validate that our research generates a result from which we can extract scientific knowledge. The choice of method in order to solve the presented problem should be made bearing in mind if what we're looking for requires a quantitative or a qualitative approach. The method's first and foremost task is to equip the researcher with principals and knowledge to use when deciding what to do when presented with an issue. In extension, if the researcher acts on basis of the method's principals he/she should end up with a survey that fulfils the demand of the work being scientific. This because of the fact that the principals of method theory are derived from epistemology, applying those principals on our work we try to ensure that the requirements needed in order to achieve scientific knowledge are met (Hartman, 2004).
2.1 Quantitative methods theory

We use quantitative methods when what we want to know is easily measured. The difficulty does not lie in performing the actual survey; it lies in making sure that we end up with a scientific result. It's central to critically examine the survey before it's executed in the sense that we want to make sure that we're only measuring parameters relevant for our work and that those parameters are what we believe them to be, meaning aiding us in giving a positivistic scientific result to our theory (Hartman, 2004). Usually, when a quantitative method is used the scientist knows beforehand which types of answer are possible and that there's a limit in variation. Quantitative methods require a high degree of standardization (Hartman, 2004). Bearing these facts in mind when deciding what approach to choose in our case we discern a couple of pitfalls; in order to make a competitive IT-product we must find out the needs, expectations and values of the target user (Ottersten & Balic, 2004). Already at a glance it's pretty obvious that those are attributes that are not easily measured, the information we're looking for is not something which is easily captured in a quantitative survey or equivalent.

2.2 Qualitative methods theory

Qualitative method is intertwined with hermeneutics, with this approach we're trying to understand why our target user do what they do and how they want to do it. In essence it's about understanding how other people depict the world. Therefore, in this case it's not about justifying the knowledge we attain during our research, it's about justifying our interpretation. When researchers choose a qualitative method their main goal is not to explain the problem since the problem aroused due to our lack of understanding how the prospective user acts in different situations. Instead, their main goal is to contextualize the problem in a way that relates and conform to the user's context. Gaining such an in-depth knowledge requires a qualitative incidence (Hartman 2004).

2.3 Choice of method

Once equipped with the pros and cons of the different approaches our weapon of choice came quite naturally, a qualitative tool was chosen because the issue of measuring have a clearly subordinate role in relation to the subjective perceptions and opinions that we want to "extract" out of people. When designing interaction in an exemplary manner we have to have a mindset that a system or artefact is incomplete without the people that use it. Even though their conceptual model doesn't correlate with ours, it might even be intractable, their goals are the point of the system or artefact, therefore we find a qualitative hermeneutic approach much more rewarding (Moggridge, 2007). The information we're hoping to derive from our research is something that isn’t materialized or visualized in a too formal and structured interview. Therefore we feel that unstructured interviews are essential when your looking for information such as underlying needs.

Faux et al., (1988) gives further insight to the idea of using a qualitative method regarding interviewing children: "Using closed-ended questions or more quantitative methods with children assumes that the researcher is aware of the child's frame of reference and can identify exclusive and exhaustive categories of response. This most often is an unwarranted
assumption, since the child-subject's and the adult-researcher's frame of reference differ widely due to differences in maturation and experience”. Faux et al. (1988) also refers to Rich (1968) and Yarrow (1960) whose research have indicated that the majority of children 6 years and older can be interviewed in a research situation.

During the process we'll be applying the ideas of Effect managing IT (Ottersten & Balic, 2004). This was decided together with SE who uses the process themselves. Effect managing IT affects above all the process and focuses on what should be done in order to achieve the desired effects meaning the effects which can be applied to the design. It’s first and foremost benefit is that it helps the project members to produce a set of requirements which have a clear impact on the product's desired effects (Ottersten & Balic, 2004). Due to this we'll firstly view the existing market, by doing so we're hoping to clarify what needs they satisfy but also, and most importantly, what needs hasn't been met. Afterwards, we'll be performing interviews based on the laddering-technique with the main purpose of finding out the user experience goals and their (underlying) needs.

![Effect map](image)

**Figure 1. Effect map**

### 2.4 Existing market

In order to form an opinion of the existing market we reviewed the existing phones and how they were presented and advertised on the Internet. This approach was chosen on the advice of SE and because of scarcity in resources.
2.5 Personas

"You can't solve a problem with the same thinking that created it"
-Albert Einstein

Alan Cooper (1999) has developed a tool for gaining insight in users need. It's called Personas and consists basically of making up pretend users based of the target groups. The underlying reason for working with Personas comes from the author's conviction that we can’t design something and expect everyone to like it, by targeting in on one specific user you'll make sure to at least please some users and most of all you'll avoid ending up with a product with possibly contradictory functions. For example when designing a website the designers might be influenced by Jakob Nielsen’s widespread usability heuristics (UseIT) and aims for a site with flexibility and efficiency, meaning speeding up the interaction by e.g. minimizing the data load. Meanwhile, they might also want to use different ways of representation, e.g. 3D-buttons, animations, effects etc in order to meet the "recognition rather than recall" guideline. These goals could very easily contradict each other and a way of solving this problem is to use the above-mentioned Persona. Regardless of what the designers "think" the user wants, we should aim for a design, which adapts to the user, not the other way around. Users of IT have through time been far too forgiving towards weak and clumsy design. Take Microsoft Word for example, even though most of us struggle a lot when using it, we choose it over writing with paper and pen almost every time. Just like we're fascinated by a dancing bear at the circus, our focus have not been on how something works, instead it's been restrained to the mere fact that it actually works (Cooper, 1999).

With Cooper’s technique we can refer to what our Persona would prefer when we encounter problems and hopefully eliminate erroneous design. This implies that the Persona must be an accurate representation of our targeted user. Otherwise we'll make the wrong decisions during the design process seeing that we're basing our decisions on the wrong presumptions. Hence, we must not forget that initially the Persona is based on hypothetical knowledge; we’ll therefore be adding facts and knowledge as our research progresses. (Our aim with using the Persona will be to "Develop a precise description of our user and what he wishes to accomplish" (Cooper, 1999).

2.6 Means-end theory

The means-end theory defines three abstraction levels of meanings: attributes, consequences and values. (Leitner et al., 2008). Attributes are the characteristics of a product (e.g. usability). At a more abstract level, the consequences are the possibilities offered by the products attributes (e.g. understand how to use the phone). And lastly, values represent abstract meanings, motivational constructs and beliefs that are tied to emotions (e.g. security). Values are goals that people strive for. The result is that the means-end theory illustrates links between the different levels of abstraction and shows why attributes and consequences are important to the user. The designers can hence focus on how to fulfil these values in the best way possible, rather than to focus merely on product characteristics (Reynolds & Gutman, 1988).
2.7 Laddering technique

Laddering is an one-to-one, in-depth interview technique used to understand how the three levels of abstraction in the means-end theory connect in the interview object’s mind. The interview starts at a low level of abstraction by finding out which attributes is most important for the user. The interviewer then asks the question: "Why is that important to you?" several times to determine the linkage between attribute, consequence and value (Reynolds and Gutman, 1988). By using Laddering and Means-end we get a good view of why and how different attributes and consequences are important to the user. This information helps us to create Personas based on accurate data about the target group.

Sometimes it can be hard to get all the answers you want by just asking open-ended questions. Therefore we constructed means-end ladders of what we thought were important to the target group before we conducted the interview to get a hint of which questions to ask. Even though our perception of the target groups’ values (especially children's) may differ from their real values, we got a starting point and some guidance for the upcoming interview. This approach also gave us the opportunity to test the earlier mentioned hypothesis; if, and to what degree, the designers’ mental model differs from the target group’s mental model.

By using the means-end theory and the laddering technique we can determine which values are most personally relevant to the user. We can then focus on how to best deliver these values, rather than to focus on attributes.

The following is an example of an interview with the Laddering technique. The interview is then analyzed into the Ladder below.

**Interviewer:** You mentioned earlier that you like to listen to music. Why is that?

**Respondent:** I want something to do while I’m riding on the bus.

**Interviewer:** Why do you want to have something to do while riding the bus?

**Respondent:** I think that riding the bus is quite boring. When I listen to music its more fun.

Value: Leisure

Consequence: The phone amuses me when I’m bored

Consequence: Escape from reality

Attribute: Listen to music

2.8 Interviewing children

When interviewing children, one is challenged with additional difficulties due to differences in maturation and experience amongst children and in the difficulties related to the relationship between the researcher and the child (Faux et al., 1988). However, children in the concrete operations stage (7-11 years) can produce more information about their experiences than younger children at the preoperational stage (Kortesluoma et al., 2003). The questions we formulate must be compatible with children's cognitive abilities, this implies using a language that children understands and use, not to simple, not to difficult (Kortesluoma et al., 2003). One challenge is that children tend to always give an answer to a question, even if he
or she is unsure of the correct answer. Faux et. al (1988) cites Becker (1970) and Lofland and Lofland (1984), who have found that this issue of reliability can be countered by letting the child, rather than the researcher, describe their world. This meant that in order for us to get reliable answers from the children, we had to ask open-ended questions, "Unstructured or semi-structured data-gathering techniques facilitate respondents in describing their points of view and enable researchers to understand the subjective perspective of respondents." (Faux et al., 1988).

The child might see the adult as an authority figure, and could therefore be reluctant to give information when they do not know what the adult want to hear. Therefore, the adult must explain the purpose of the interview, and ensure the child that there is no right or wrong answer. To reduce anxiety, the interviewer should clarify the purpose and expectations of the child and the interviewer’s role (Faux et al. 1988 cites Edelbrock & Castello, 1984; Yarrow, 1960).

The interviewer should also choose a location that is less formal and more familiar to get the child to see the interviewer as an interested adult, rather than an authority figure. Faux et al. (1988) states that it might be hard to motivate adolescent children to participate in an interview, however school-age children are often motivated by their wish to please adults. Other aspects to consider are children's limited ability to grasp abstract concepts. Faux et al. (1988) recommends a pretesting of the words that shall be used in the interview to get knowledge about which words are hard for children to understand. Though, due to the limitation in time, we skipped this pretesting and instead tried to use as few abstract words as possible in the interview and asked control questions in order to make sure that the child had understood what we meant.

It was often possible to feel when the child had difficulties understanding a word, we then tried to use a less abstract synonym, or explain using a concrete scenario. Because of children’s limited ability to concentrate over a long period of time (Kortesluoma et al., 2003), we limited the length of the interviews to 30 min. This kept us within the recommendations from Faux et al. (1988) that school-aged children can be interviewed in 30-45 minutes. By bearing this research in mind on how to interview children we felt more confident that we could conduct the interviews successfully and get relevant information regarding the means-end of children.

2.9 Sample

The use of Laddering as our interview technique presupposes that the interview objects fit the characteristics of our target group. This meant that we chose to interview children in grade 1-2 at a local primary school. Thus, we had respondents in the age of seven to nine years of age, who owned a mobile phone or had used a mobile phone regularly. The number of interviewees was selected to be large enough to give a good representation of the target group, but not to numerous due to the time-consuming nature of conducting and analyzing qualitative interviews. We were unable to get the respondent's parents to do interviews for our target group of parents with children age 7-9 and therefore had to use other parents, who still fulfilled our requirements. We see some weakness in the selection of our sample, we
didn't interview a child who had actual experience of a child mobile phone, instead we relied on the findings from our research on the Internet. We could have also considered a better geographical spread of the interviewed children, as it happened all the children attended the same school.

2.10 Implementation

2.10.1 Initial needs analysis
We started our process by evaluating the existing markets of mobile phones aimed at children. We analyzed commercial information about the phones, expert reviews, user reviews, newspaper articles and blogs. We also looked at articles describing parents' use of mobile phones (Palen & Hughes, 2007) and about the design and use of children’s mobile phones (Cao & Kurniawan, 2007., Berg et al., 2003). This information, combined with information attained from interviews with SE, gave us a starting point and an initial feel of the needs of our target group.

This input of data, combined with our own intuition, enabled us to create ladders for our Personas: Linus 8 years, and Per 37 years. The ladders gave us an indication on what areas that would be of interest to investigate further in our interviews.

2.10.2 Interviews
9 children and 4 parents were interviewed, none of the interviews lasted shorter than 15 minutes or longer than 30 minutes. The interview method we chose was semi-structured. This meant that we had constructed an interview guide, and had an idea in what order we should ask the questions. This guide was structured according to the Laddering technique described in Reynolds and Gutman (1988).

Hartman (2004) as well as Faux et al. (1988) points out the importance of in what order the questions are asked to get the respondent in the right mood. Therefore we started with some warm-up questions. We then continued with some open questions to avoid yes and no answers, and to let the respondents elaborate about their thought, feelings and opinions. If we noticed that the answers had drifted to far from the subject that we were interested in (the means-end ladders) we had a set of probe questions to get the discussion back on track.

The respondents got to formulate their answers in whatever way they wanted, and new questions were allowed to be brought up during the interview. The fact that we also interviewed children made the interview more difficult to structure because the child often drifted away from the subject. Hartman (2004) points out the importance of an interview guide to avoid that the information from the interview becomes irrelevant due to the tendencies that the subject of discussion drifts.

The adults were interviewed with the same technique as the children, but with a more straight-on approach that suited the adults better. Less tinkering was needed to get a satisfying response, and there was less drifting from the subject compared to when we interviewed the children. The adults also had an easier time to elaborate when asked open questions, and the process of constructing ladders were easier than with children.
All of the persons we interviewed allowed us to record the interviews. This was an advantage because it enabled us to fully focus on the interview instead of dividing the focus between the interviews and making notes. We are pleased with the interview result and felt that it gave us empirical saturation as well as it greatly widen our understanding for the target group.

2.10.3 Ladders
The next step was to transfer our interview results into ladders describing the means-end of each of the respondent. This enabled us to see which ladders the respondents more frequently mentioned. We then used that information to aggregate the ladders from each respondent into two hierarchical value maps (HVM), one for children, one for parents. These maps visualized which attributes and consequences were most relevant to the respondents and how they connected to their values. These values served as a basis when we selected user experience goals and aided us in conjugating the essence of the phone and at the same time finding a couple of core functions which could set a presumptive phone apart from it's competitors.

2.10.4 Personas
Personas can be presented in different ways. One technique that Cooper mentions is that the Persona is printed on a paper with a picture of him and short scenarios of his wants, needs, dreams etc. However, as Personas is a tool created to help the designers in their design process, it is up to them to decide which type of presentation they prefer. We therefore thought that the best way for us to present the Personas would be to use the HVM we created earlier. We are familiar with the laddering technique, and think that the maps give a clear and structured view of the Personas.

The advantage of presenting the Personas the way Cooper suggests, is that the pictures and scenarios gives a stronger emotional connection between them and the designers. However, for us, the most interesting part is that the Personas are based upon a solid empirical analysis, and we found it less relevant to speculate in what way the designers would like the Persona to be presented.

3. Result

3.1 Existing Market
Two categories of phones could be identified. One category is aimed at younger children (roughly 4 to 8 years) with focus on a playful design with bright colours, tracking abilities, and very limited functionality (e.g. Gecko Phone, TicTalk, Teddyphone). These phones are marketed to the parents as devices that have the ability to make the parent confident that the child is safe. These phones also have restrictions built in that make abuse, and excessive use, of the phone more difficult. The marketing to children is focused on the visual design of the mobile phone and the fact that it is customizable. Games are also a function that is marketed. The interaction design of these phones is all about simplicity. The buttons are few and are
often visualized by figures that are meant to make it easier for the child to understand which button control which function. The menus are often text-based.

**Existing Market**

![Figure 2. Sample of phones from the two categories found](image)

The other category of mobile phones is aimed at older children (8 years and above). They have a visual design that is less cute and basically looks like a cooler version of a regular mobile phone (e.g. Disney phone, Samsung Tobi, flyPhone). The functionality is also more similar to regular mobile phones (e.g. camera, SMS, music player). The marketing aimed at parents in this group of mobile phones is also focused on the child's safety. The focus on safety in the sense of limiting the child's use of the phone is also prominent. This is due to the increased possibilities of misuse related to the increased functionality. The marketing to the children is focused on how fun the phone is, and the fact that the phone has the functions also found in regular mobile phones. The interaction design is often similar to simpler regular mobile phones.

Another way to get a child friendly phone is to choose an operator that focuses on children. Those operators offer regular mobile phones, but with increased functionality implemented by the operator (primary functions to control the use of the mobile phone). This kind of offer where generally the most favoured by the reviewers as it makes it possible for the child (marketed at 10 year olds and above) to get the phone they want, while still enabling the parents to control the use of the phone.
**Figure 3.** The table represents the findings from our research of the existing market.
3.2 Interviews
The result of the interviews are presented as a compilation of what we saw fit and mattered considering our thesis.

3.2.1 Children
Nine children were interviewed between ages 7-9. The main use of the mobile phone was to make, or receive, calls from their parents and close relatives. The reason for this was for convenient and safety purposes:

"I can call my mom when I have forgotten my key"

The children in grade one (7-8 years) had a limited amount of friends with a mobile phone, and therefore did not use it to call them to any great extent. They preferred to use the regular phone at home for that purpose. However, children who had friends with phones told us that this made it possible for them to play more with their friends since it was easier to get in contact with each other. The other big benefit for the children was to amuse themselves, or to pass time, by using the entertainment functions on the mobile phone. The most prominent activities were to play games, take photos and to record sound and video:

"I take pictures of pretty animals when I travel"

The games on the mobile phone was conceived as rather boring, and were therefore replaced by more fun activities (e.g. Playstation, computer games) when possible, for instance when being at home. Capturing pictures and recording sounds however, was an activity that the children valued higher and not just when they’re passing their time. The children also liked to show pictures and play sounds to friends and family to share their experiences. They also used the recording functions (video and sound) to horse with friends and family:

"Karl have recorded a film of when mom snored and showed it to me."
"I have funny recordings that I use to do crank calls"

The possibility to send photos and sound (MMS) was a function that was appreciated by the children. The few children who could handle the function liked it, and the children who did not know how to send mms or that it was possible to do, expressed a strong will to be able to do so. The children liked to watch cartoons on TV, and they would like an option to do so on the mobile phone as well. Scenarios told by some of the children were that they had in some way been lost from their parents. In those situations they would have liked to have a mobile phone to be able to find them again:

"I once lost my parents at the supermarket, but I did not have my mobile phone then. It would have been very good to have it."

A common trait among the respondents was that they had problems to perform and understand the functions on the mobile phone. The problems were connected with the layout of the menu and the keypad which made it difficult to find functions and use text-based functions like SMS.
"It's hard to know how to write when letters and numbers are mixed on the keypad. It would have been better with a regular [qwerty] keyboard"

The children often had to resort to their parents or others to get guidance on how to use the mobile phone. Some children also found the contact book hard to understand. They found it easier and preferred to make a call by punching in the numbers manually. Other issues regarding the usability of the phone where some of the children’s lack of understanding of the interface of the phone (e.g. understanding the battery symbol):

"I recharge the batteries when the phone goes blank"

The older children (8-9 years) used the advanced functions (e.g. listen to music, transfer music with Bluetooth, organize with the calendar) to a greater extent than the younger children. They also showed a greater understanding of how to use the phone and its more advanced functions:

"I listen to music when I'm riding in the car and when I'm walking to friends."

However, they sometimes felt restricted to use them because their parents had told them that they were expensive to use (e.g. browse the internet, send MMS). Sometimes it was difficult to follow the interview structure proposed by the literature. Especially at the highest level of values, it was hard to get a natural response, and the child became quiet and unsure. At those times we were forced to ask direct questions that were followed by answers with more of a yes or no nature.

### 3.2.2 Parents

Four parents with children between 7-9 years of age were interviewed. Two of the parents had a child who owned a phone. The interviews revolved around the following topics;

**How, why and when do you want your children to use a mobile phone?**

For most parents providing their children with a phone was a matter of comfort and safety. Comfort in the sense of coordinating activities and making sure that the child comes home at a given time or being able to get in touch if they are delayed or forgets anything. Parents also felt that they could allow their child to do more if they were equipped with a phone; this was also due to that the child's moving boundaries change as they become more mobile. As one parent put it:

"Having a phone should coincide with spatial zones, as a child grows up so does the spatial zones and when they've increased to a size where I no longer can stand on the front porch and get in contact with my child it's time for a mobile phone"

Safety was also stressed, they wanted to be able to contact the child but most importantly, that the children should feel that they can get in contact with their parents. Therefore, the parents wanted it to be very easy for the child to make a call, especially to them. The parents with children who had phones mentioned that they (the parents) had added all numbers in the phonebook, and that they were quite sure that their children weren’t able to manage it themselves. Their children were also not using SMS, partly because they weren’t able to master the function. One parent suggested that it would be easier for the child if they called a person rather than a number, if for instance the child tries to call dad at work and no one
answers the call gets automatically diverted to dad's mobile phone. In a bit of a similar matter they requested a function, which not only indicated that their child had received an SMS but also that it had been read.

From both an economical and safety aspect they were all interested in limiting the functionality. They considered a pay-as-you-go solution as sufficient for controlling the economics, which they saw as important seeing that a child's perception of time and money is not fully developed at that age;

"Children don’t always understand that there's a cost involved, "does it cost to send a message?". They also have a very vague perspective on time; they don't know if they’re on the phone for one minute or ten. They can’t take responsibility for a phone before that"

Regarding the safety issues they were mostly considered about controlling who the child could get in contact with and what kind of communication they were able to do. For instance, just being able to take pictures isn’t that threatening but once you're able to send and receive pictures the parent's opinion changes;

"They shouldn't be able to contact whom ever they want. Functionality which previously was limited to the computer can be found in a mobile phone today and a child doesn't have the necessary judgement to determine who you can be friendly with or not"

Moreover, parents could sense a pressure to provide their child with a phone, if all the other children have one they don’t want to make their child feel different and excluded. Children today views the phone as a cool thing to have and they definitely don’t want a phone with a "toy feeling" to it, it's a grown-up attribute and it needs to be cool for the children in order for them to remember to bring it with them. One of the parents said that usually they have to remind their son to bring the phone with him when he goes out. He does however remember to bring the phone when the family is travelling;

"If we travel somewhere with the car he uses it to play games. A 40-minute trip is long for a 8 year old. Then it's worth a whole lot if the child has something to do"

All parents stressed that they would prefer if the phone could provide their child with something to do during family travelling. Music, games, watching movies and audio books where mentioned. The parents saw a value in this for themselves as well, if their child had fun and was happy they were also happy and relaxed and could focus on their own.
4. Discussion

4.1 User Experience Goals and Laddering

Starting at the bottom of a ladder the attributes describes what are most important for the user. One level up in the ladder is the consequences that explain why the attributes matter to the user. At the top are the underlying values that describe why attributes and consequences are important. From this information we selected a couple of consequences as our User Experience Goals (UEG). These are goals that are not too abstract (like values), or concrete (like attributes). UEG is a technique used by SE to single out the most important goals that shall be the focus in the design and marketing of the phone. The designers can consult the UEG to get information regarding if a functions is legit or not. We selected these goals based on our research of the existing market, our interviews, and our dialogs with SE. This enabled us to select goals that we think are the most relevant ones to the user, and at the same time makes the phone stand out from its competitors.

The HVM presented below have been downsized for viewing reason (appendix A contains the entire HVM with all fields extracted). In each HVM all UEG are visible and have been numbered. One of the UEG (nr 1 for the Linus and nr 3 for Per) is fully extracted in order for the reader to follow the different steps of values, consequences and attributes.
4.1.1 Child Persona

4.1.2 Parent Persona
4.2 Timelines
SE introduced the technique presented below. They use it as a complement to the effect map, it's a tool used to depict at what time during the customer buying process each user experience goal has the most impact on the customer. As a frame of reference for knowing when a goal matters more or less SE has added a second timeline that indicates what type of attribute the customer prefers during our process. During the time up to the actual purchase "coolness" is preferred; this refers mostly to the look and feel of the phone and a couple of core functions that separates it from other phones. Once purchased usability becomes the most important issue for the customer, during the first hour of use, the user should be able to handle basic functionality such as making a call, adding a number in the phonebook, SMS etc. Moving on we reach the utility phase which concern use over a longer period of time, essentially what kind of difference the phone make in the user's life. This will to a great extent determine whether the user chooses to repurchase from the same manufacturer or not.

4.2.1 Timeline for Linus
The weighing of each UEG was made upon the results from our empirical study and on the advice of SE. The first goal, "escape from reality", was considered as something that had most impact during the marketing phase, and something that could catch the attention of the child and parent. We also recognized goal 3,5 and 6 as important before the actual purchase. During the usability phase we depict that goal 4, allures to exploration, as crucial since this is when their utility of the phone is partially decided. If they don’t get the hang of the functions as the designer intended, the chances for a repurchase from the same supplier drastically decreases. For instance, the UEGs during the utility-phase requires a understanding of the phone's functionality, if the child doesn't achieve the functionality goal (nr 4) the remaining goals will be very difficult to achieve resulting in inadequate utility.

4.2.2 Timeline for Per
During the marketing phase we picked goal 2 and 3 as most important, this was almost entirely based upon our interview results; all parents mentioned either one or both of the goals as most important. During the usability phase goal 5 was chosen, it correlates with that of Linus functionality goal; in order for goal 5 to be achieved it's vital that Linus understands how to use functions as listening to music, playing games, watching movies, SMS etc. All goals where considered crucial during the utility phase, this can be explained by the nature of the goals, they are all important in a positive way when reflecting upon what kind of difference the phone makes in the long run of peoples’ lives.
Child Persona  
Linus 8 years

1. - Escape from reality
2. - I can share experiences with friends and family
3. - I know where they are, what they are doing and can participate if I want to and vice versa
4. - The phone allures to exploration which makes me want/dare use functions that I can’t already use
5. - I know that it always works (safety)
6. - I can get in touch with someone in an insecure situation
1. - Linus should find it fun and want to communicate with me via the phone.

2. - I know where he is, how he’s feeling and he can contact me at any given time.

3. - I have the possibility to control with whom and for how much Linus spend on calls and

4. - The phone enhances my relationship with Linus, we got more ways to communicate in which stretches over time and space

5. - The phone aids me both when I’m present and absent resulting in freeing up time to do other stuff
4.3 Existing market

When examining the existing market and our interviews we tend to see that there is a difference in how we and the designers of the existing phones view the target group. Our research of the phones that exists on the market indicated that the designers had thought about the problem of younger children's limited abilities to handle a mobile phone. The phones aimed at the younger children had a very simplistic design meant to make it possible for the child to use it. The direct result of such a phone is that the functionality becomes very limited.

These phones are basically devices made for calling only, which according to our interviews with children isn't enough to meet their needs. Also, the children we spoke to wanted a phone that looks like a phone, not a phone that looks like a toy. The phones aimed at older children (8 years and above) had the layout and functionality of a regular mobile phone, but with increased ability for parents to control the use. On the other hand, the children who had a fully functional phone weren't using it for much more than calling even though they expressed a wish to do so. Someone else had usually taught the children who did know how to use the phone in other ways when a child knew how to use other functions.

The age-distinctions that emerged reviewing the existing market might be correct in our opinion if the target group of the simpler phones would be children in the age of roughly 4-6 years and if the target group for the more advanced phones were children over 10 years. However, as our interviews showed, children in the age of 7-9 years demand advanced functionality from their phones. The problem is that their level of cognitive development makes it hard for them to understand how to use these functions. As the market looks today they are left with two choices; either a phone that they can use but that lacks functionality, or a phone with the desired functionality but with which they must struggle to learn. This indicates that there's a market segment for a phone with functionality adapted to the cognitive development of children aged 7-9. Thus, the issue is how to implement the functionality desired, while making it easy to learn, and in extension evading the need for someone else to tell you how to use the functions.

During the interviews we discovered that most of the children with a mobile phone had inherited their parents phone, we must therefore consider parents old phones as a competitor and at the same time we recognize a need for creating incentives enough for parents to buy a new phone for their child instead of letting them use their old one.
4.4 Closing discussion

As expected a discrepancy in needs was materialized when comparing our results with our initial understanding of the problem context and also compared to the needs that the phones of the existing market satisfy.

Our interviews with children indicated that most of their usage consists of making and receiving calls even though they were using phones that had a full range of functionality. Their shortage in the variedly of use wasn't due to restrictions or a lack of interest since all of them expressed a wish to use other functions. Rather, our result indicated that it could be due to that using those other functions instigates a learning curve beyond their cognitive capability. E.g. the children themselves were unsure of the steps involved when constructing a SMS.

Some of the children also had difficulties understanding that the buttons on the keypad could be used for both calling and writing; especially that one button could be used to write more than one letter. In these situations the designers must bear in mind that for many of the children it's their first in-depth use of a mobile phone, they don't have the basic understanding of a phone's functionality which many designers seem to presuppose.

This is in one way understandable, for most of us there's no need for the phone to teach us how to use all the functions, once we've learned the basic functionality we can virtually pick up any phone and make a call, text, etc. On the other hand, since a child is a first-time user they have a much harder time relating to the conceptual models of the designers, if you've never used a phone before it might be difficult understanding what the symbols on the menu relate to.

One way of explaining this is to view the ideas of Piaget (Gelderblom & Kotzé, 2008). According to him the child adopts to the environment in two ways; Assimilation and accommodation. Assimilation means that the child applies its current knowledge to interpret the world. Accommodation happens when current knowledge does not fit with the external environment and new schemes must be constructed, or old ones changed. One solution that would probably make it easier for the child to understand how to use the phone would be to assimilate children's current knowledge with the phone. This could mean that the symbols used on the phones have a clearer link to the knowledge already attained by the child. The symbols for playing games, the phone book or the alarm clock for example, should be something that the child in that age recognizes from their everyday life, and associates with that specific activity. These symbols are not obvious for a child that have never used a phone before. The child's current knowledge about the world and conceptual model does not help them sufficiently enough on how to use a standard phone. The child needs to accommodate their current knowledge to fit it with the new environment (the phone). This is done today with help from friends or another adult.

Our result also showed that older children in the second grade showed a greater ability to understand more advanced functions. This could be related to Case's theory (Gelderblom & Kotzé, 2008) that children develop the ability to handle multiple dimensions around the age of nine. This skill is needed in order to perform the different steps required to use the more advanced functions in regular mobile phones.
One of our questions mentioned earlier was if, and to what degree, the designer's idea about the needs of the user differs from the user's actual needs. We mentioned earlier in the discussion that we found signs of that when comparing our research of the existing market with the findings from our interview. Another way to study this is to compare the ladders we created prior to our interviews with the ladders we constructed after the interview. This would enable us to see if we were wrong in our presumptions about the needs of children. This comparison is lacking in a way because the designers in this case is us, and we have no prior experience of designing a mobile phone. It is reasonable to believe that the “real” designers have assimilated a good knowledge of the user after working some time in the design process. On the other hand, the development of phones for children is a new branch and it is possible that the knowledge which the designers have attained in developing mobile phones for children is inadequate. Furthermore, it is reasonable to believe that the knowledge of designing regular mobile phones for adults obstruct them when trying to design a phone for children.

When we compared the different ladders we could see that there existed a difference between our view of children’s needs and their actual needs. To name one example from the children's HVM, we believed that one of the most popular activities on the phone was to play games to amuse themselves. However when we analyzed our interviews, it became clear that games were not that popular, and that it was used mainly to pass time. That function was clearly not the most important for the children (at least not with the games available in the phones they had inherited from their parents). Instead it was functions like taking pictures and recording sound and video that was used to amuse themselves. One important thing to consider when interpreting this is to analyze whether a function that is disliked is so because the person does not value the activity high at all, or because he or she does not like how the activity is implemented in its current use. To illustrate, in our example we mentioned that children don’t care about games to the extend we thought. We depicted how that was not because they disliked to play, rather it was because the games on the phone were boring compared to what they are used to. This is something to consider when evaluating the needs.

The game-example points out that we might have weighted the importance of the activities on the phone wrong. There were also new insights when we compared the Ladders of parents with the HVM created after the interview. An idea we had was that the phone would strengthen the relationship between parents and their child. This was to one degree supported, for example, when parents and children indicated that the child thought that it was fun to talk with their parents through their mobile phones. However, the result also pointed out that these phone calls was often of a routine nature concerning matters like that "It's time to come home for supper". One parent went even further when he explained that the phone "should merely be used as an amplification of other communication forms, not be a substitute". This points out that some parents might see the mobile phone as a negative artefact that affects the relationship in a negative sense. Insights like these affect what the designers and marketers should consider in the design process.

These two examples illustrates that our initial view of the needs differed from some of our target groups actual needs. It is also reasonable to think that the same might apply for real
designers and their views of the users, particularly when considering our research of the existing market and the fact that a couple of the phones already made for children have been discontinued. One could therefore conclude that further research is needed in the area of mobile phones for children, especially within the field of cognition. As shown in this study a child thinks differently when using information technology, ultimately if a designer wants to create an artefact which meets the needs of children it will require him to think differently as well. He can't rely on his own rationality since it clearly doesn't conform to that of a child.
References


