Role of Mobile Technology in Social Bonds in Playgrounds

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Abstract

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Mobile technology is ubiquitous and also influential in different spaces. This master thesis was a design exploration to study the impact of mobile technology on relationships among parents and children at playgrounds. The study consisted of three methods to get an insight on the issue: (1) a pre-study to get acquainted with playgrounds and needs of targeted people, (2) a design exercise where a photo taking prototype was created and its mobile application was implemented, and (3) a user study where people that visit the Pelle Svanslös playground were interviewed. The mobile application was aimed to be a social platform to be used at playgrounds to share photos among people. The results consisted of different views of parents that were interviewed about the issue. These different views were divided into categories and conclusions were drawn. The categories consisted of interaction levels of children at the playground, and parents’ perspectives on the use of photo sharing applications and their effects on communication. This study serves as an initial understanding for the impact of mobile technology use at playgrounds.
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# Contents

1 Introduction ............................................... 1
   1.1 Background and Motivation .......................... 1
   1.2 Research Goal ........................................ 2
   1.3 Research Questions .................................. 2
   1.4 Delimitations ........................................ 2
   1.5 Description of the Task .............................. 3
   1.6 Structure of the Thesis .............................. 3

2 Related Work ............................................. 5
   2.1 Children and Technology ............................ 6
   2.2 Mobile Technology Design for Children ............ 7
   2.3 Photo Taking and Sharing Interaction ............... 9
   2.4 Playgrounds and Technology ......................... 10

3 Methods .................................................. 13
   3.1 Pre-Study ............................................ 15
   3.2 Design Exercise ..................................... 15
   3.2.1 Prototyping ...................................... 15
   3.2.2 Expert-based Testing ............................ 16
   3.3 User-Study ........................................... 17
   3.3.1 Data Collection .................................. 17
   3.3.2 Data Analysis ..................................... 18
   3.3.3 Mobile Application Trial ......................... 20
   3.3.4 Persona .......................................... 20

4 Results .................................................. 21
   4.1 Pre-Study ............................................ 21
   4.1.1 Nydalsparken playground ......................... 22
   4.1.2 Humlegården playground .......................... 23
   4.1.3 Pelle Svanslös playground ....................... 24
   4.2 Design Exercise ..................................... 25
4.2.1 Prototype ................................................. 25
4.2.2 From Prototype to Mobile Application ................. 25
4.2.3 Mobile Application Development ..................... 27
4.3 User-Study ................................................ 32
  4.3.1 Data Analysis ....................................... 32
  4.3.2 Parent-related Results ............................... 33
  4.3.3 Children-related Results ............................. 38
  4.3.4 Results from Instagram users ....................... 42
  4.3.5 Personas ................................................ 43
4.4 Discussion ............................................... 45

5 Conclusion ................................................. 47

6 Future Work ............................................... 49

Bibliography ................................................. 51

Appendices ................................................... 57

A Interview/Survey Questions ................................. 58
  A.1 Parent-related Questions .............................. 58
  A.2 Child-related Questions ................................ 58
List of Figures

3.1 Design thinking ................................................. 14
3.2 Brochure ......................................................... 18
3.3 Online survey .................................................... 19
4.1 Nydalsparken playground ........................................ 22
4.2 Humlegården playground ........................................ 23
4.3 Pelle Svanslös playground .................................... 24
4.4 Views from the prototype ...................................... 26
4.5 Share view of the prototype ................................... 27
4.6 Views from the mobile application ............................. 28
4.7 Share view of the mobile application ......................... 29
4.8 Screen-shot from Interface Builder GUI design ............. 30
4.9 System design [2, 6, 7, 8, 10, 12] ............................ 31
4.10 Taking photo in the playground ............................ 33
4.11 Variety of photos ................................................ 34
4.12 Use of social media .............................................. 34
4.13 Variety of applications ...................................... 35
4.14 Ways of place-finding over the Internet .................... 35
4.15 Ease of place-finding over the Internet .................... 36
4.16 Age range of children ......................................... 38
4.17 Use of mobile technology ..................................... 39
4.18 Ownership of mobile technology ........................... 39
4.19 Variety of applications ...................................... 40
4.20 Level of help when using mobile technology ............. 41
4.21 Taking photo with mobile technology and variety of photos ... 41
4.22 Parent persona ................................................ 43
4.23 Child persona .................................................. 44
Chapter 1
Introduction

1.1 Background and Motivation

As technology evolves and potentially becomes smarter, designing for interaction with networks of devices has become more challenging. The purpose of these technologies (the so called “Internet of Things”\(^1\)) is to support our needs and make it easier to increase our level of comfort. This project focuses on designing for an innovative setting: communication among children and parents in playgrounds, with a design-led exploration using mobile phones.

Children enjoy spending their time in playgrounds. However, they may not be able to go to playgrounds whenever they want, and some families may have limited access to playground facilities. Accordingly, ways of transporting the “play” to remote places, such as a home, or in the same way transporting something from home, such as personal belongings, to the playground should be considered. One of the most important features of the playground that can be used in technology design is the social bonds that are created there. As people keep coming to the same playgrounds, in time, they form a community and become “Familiar Strangers”, which is Milgram’s term for individuals who recognize but do not personally know each other [26]. Paulos et al. also define Familiar Strangers as “...individuals that we regularly observe but do not interact with.” [28]. One way to support the bond between Familiar Strangers is to simulate physical presence in a playground from a remote place by creating possibility to track the stream of activities in the playground. The overall goal of this master thesis is to explore ways of benefiting from the existing technologies in order to support social bonds among children that come together in a shared playground.

\(^1\)http://whatis.techtarget.com/definition/Internet-of-Things
1.2 Research Goal

The aim of this thesis was to make a design exploration to see how mobile technology affects social interaction in playgrounds and the possibilities of supporting social interactions among parents and children.

1.3 Research Questions

The research questions that have emerged at the beginning of this thesis are as follows:

- How can mobile technology support social bonds among Familiar Strangers (children and parents) in playgrounds?
- How can interaction be supported when children are away from playgrounds? (E.g. winter season when playgrounds are impractical.)
- How should the design of a mobile application be for children? What are the most prominent qualities?

1.4 Delimitations

This project was a design exploration in a defined context; hence there was not a fully functional end product, rather the developed mobile application was used as an instrument to derive design implications. In consideration of time limitations, only one type of playground was chosen as the location of the pilot study, which is a thematic playground located in Uppsala called Pelle Svanslös Playground. The details for this choice and other types of playgrounds will be explained in Chapter 4. There was also a limitation related to seasonal weather conditions, as the observations in pre-study phase collided with winter time.

There are a variety of technologies that can be used for the goal of this master thesis; however, only one type of technology was chosen to narrow down the scope of the project. The mobile application was developed for iPhone, thus other platforms such as Windows Phone or Android phones are not supported. There are no personal profiles, all images are anonymous and privacy is protected in the mobile application.

Privacy and security is an important issue however this thesis does not cover that aspect; however, some suggestions and ideas will be discussed about these issues in Chapter 6. The mobile application trial was controlled
in terms of content, hence children and parents were not exposed to unwanted photos in the trials of the mobile application.

Even though it would be more effective to include children directly in the study, only parents' perceptions were collected and evaluated. Information about children will be gathered via their parents.

1.5 Description of the Task

In this project, a mobile application was designed and implemented that aimed to enable children to interact in a playground by sharing photos. The process was user-centered, where different needs of users were considered and feedback from users were collected. The mobile application was tested at a playground with limited number of users. The mobile application was an instrument to explore design considerations in a playground context. The design was developed through an iterative process, engaging with different potential designs and uses while taking users’ reactions into consideration. The study consisted of pre-study, design exercise and user study phases.

One possible scenario of a mobile application was allowing users to fetch and upload pictures of relevant categories (books, objects or animals) and share with others in the playground. Moreover, it would also allow children to interact with other children in the playground remotely by allowing viewing of the pictures. As the mobile application has a map view that shows other playgrounds, parents could also follow it to facilitate finding places and exploration of different playgrounds.

1.6 Structure of the Thesis

For the rest of the thesis, the structure is Chapter 2, where literature related to this study is reviewed, Chapter 3, where methodology of this study is explained, Chapter 4, where findings of the study is revealed, Chapter 5, where overall discussion of the study is presented and Chapter 6, where recommendations to take this study further are made.
Chapter 2

Related Work

There are a lot of work that have been done related to this study from various angles and scopes which are the relation of children and technology, designing mobile technology for children, photo taking and sharing interaction and technological developments in the playgrounds.

Most of the children these days are very into technology and spend most of their time interacting with technology at home or school. Today’s children are being called “Digital Natives” meaning that they are born into technological world and they grow up with technology. The generation who met with technology in their adult age rather than their childhood is called “Digital Immigrants” [32]. According to Prensky, there are big differences among these generations in terms of how they think and process information [32]. Therefore, the needs of digital natives are different and designing new technology should be according to their needs. Attention span of digital natives are much shorter than digital immigrants. Hence, a design should be motivational to keep children engaged with a new tool. Prensky discussed that attention span of digital natives is shorter for the things they are not interested in, but this span is quite long for technological interactions such as playing video games for several hours without any interruption [31].

Tilvawala et al. listed many differences among digital immigrants and digital natives; such as digital immigrants prefer to talk over the phone or in person whereas digital natives prefer communication via social platforms such as Facebook, digital immigrants like to do one task at a time, whereas digital natives like multitasking (studying and listening to music simultaneously) [41]. Another difference is that digital natives prefer visuals than text, and when they meet with a new tool they prefer to explore it intuitively rather than sticking to its manual [41].
2.1 Children and Technology

In the literature, there are various work done about children and their use of technology. The common idea is that children have different thinking patterns since they are still in progress of cognitive development.

Children have different needs than adults as their mental skills are developing. Chaudron et al. stated that cognitive capabilities of children may not be enough, so they need help while using mobile technology [18]. Kinnula et al. also stated that literacy is a huge barrier with children to learn how to use mobile technology [23]. Therefore these barriers should be taken into consideration when designing for children. Moreover, Plowman et al. found in their studies that children need parental mediation while completing tasks related to photos and videos on the mobile technology [18]. For example, when a child takes a photo, she or he might not know how to save it due to lack of literacy level or simply might not know the next step. Plowman stated that children are initially overwhelmed with technology, so they are not actually digital natives and they need help. Plowman introduces “guided interaction” concept where children get help from their parents or relatives as they observe how children interact with digital technology and then engage in their learning accordingly [29].

Jarkievich et al. [22] focused on children, where they observed and interviewed digital natives and aimed to get their views on technology and usage patterns. The aim of the investigation was to find out how children use mobile phones in public indoor and outdoor spaces and they found that children shared extensive amount of media content with each other, which led to increased social interaction [22]. For example, one group of children that was interviewed played a “photo war” game that they just made up among each other. In this simple game, children are divided into two groups and each group tries to take photos of the counter group. The group with a photo that includes most members of counter group wins [22]. These findings serve as a basis to this thesis with photo-taking and social interaction point of view, except the focus is on parents’ perceptions in this study.

There is an ongoing debate on the negative and positive effects of using technology for children. Some parents are also not sure whether technology is for the good or bad for their children. In a study that Plowman et al. conducted, they found that parents are equally divided on whether the Web is harmful for children [30].

For the positive aspects of using of technology, McPake et al. stated that technology is a potential to facilitate communication and creative tasks [25]. Namely, McPake compared these tasks and gave traditional and digital examples such that children explore visual expression by digital real pho-
tographs rather than symbols and drawings which makes it more realistic and easier for cognitive comprehension [25]. An example to development of these cognitive competences is from their observations of children, where a child called Colin who already became a photographer at the age of three, communicates with distant relatives with photographs even though he is not able to read or write [25]. Another positive use of technology is use of iPads in education. iPads allow students to collaborate instantly during lessons and children can access information easily. In particular, Hendersson et al. conducted interviews with teachers and found that iPads are useful and as a result they list three advantageous features of iPad; mobility, engagement and collaboration [20].

When it comes to negative effects of technology on children, there are various aspects as well. For example, overuse of technology such as playing video games may cause physical inactivity. Lately, companies try to overcome this issue by involving body movement in their games. Microsoft Kinect¹, Nintendo Wii² and Sony PlayStation Move³ are some of the gaming platforms with motion-sensing. Chaudron mentioned a negative aspect of using mobile technology which is involuntary financial loss. [18]. For instance, children may make in-app purchases due to their low or none literacy level. Apart from these negative effects, there are also online risks for children such as cyberbullying and access to inappropriate content. In this study, parents were asked about both positive and negative aspects of using mobile technology, and also impacts of enabling technology into playgrounds were sought.

2.2 Mobile Technology Design for Children

As mobile technology become more pervasive and used by children, guidelines and implications were suggested for future designs. Common design suggestions base on literacy levels of children and importance of visuals are revealed in most of the studies. Chaudron stated that reading and writing capabilities effect the level of digital interaction of children, therefore visuals should be dominant in a mobile application [18].

Simplicity is another important design principle in general but it grows in importance when it comes to design for children. Stephen and Plowman also mentioned about the importance of simplicity in their study and state that children are lost in choices in mobile applications due to their evolving cognitive capabilities, hence there should be less choices. [35].

¹https://www.microsoft.com/en-us/kinectforwindows/
²http://www.nintendo.com/games/detail/WJf00CfP1XohzLbC4fR3NE07WwRav2AE
³http://en.wikipedia.org/wiki/PlayStation_Move
As children have limited literacy level, audio is a significant way of interaction for children. Albu et al. observed the importance of audio feedback in their design process of a mobile application that has a concept of a Christmas calendar [13]. Revelle and Reardon also recommended using audio prompts for feedback and guide in a mobile application deriving from their test results of interactive reading application that runs on iPod Touch [33].

Chau investigated 100 tablet applications from Apple’s App Store and their level of appropriateness to preschool children aged three to five [17]. The applications were analyzed according to a framework that contains four design principles; interaction, visual, audio and instructional design. Some examples to these principles are: interface should involve intuitive gestures and less text, there should be audio guide in the application, visual design should be with minimal distraction and the application should support teaching its features to new users [17]. The evaluation showed that 58% of applications were designed meaningfully which leads to positive technological development. Chau also added that for an application to be developmentally meaningful, it must be appropriate to the needs of young children and content must be appropriate to develop their cognitive, emotional and social skills [17].

Vodanovich et al. defined five design dimensions for digital natives; personalised, social, interactive, intuitive and attractive. Personalised dimension is about adapting specific needs of children to an application. Social dimension is about ability to express virtual personality. Intuitive dimension is about navigating easily in an application. Attractive dimension is about having “cool” and up-to-date application design [42].

Wyeth conducted an ethnographic study in a kindergarten on the use of technology by young children which provides implications for design. The findings emphasize that play materials should improve creativity of children and provide an opportunity to discover and construct [45]. Wyeth also added that technology is important for social interaction in a way that children can take photos and share them with their parents [45].

Berggren and Hedler came up with a tablet application called CamQuest which is for preschool children aged four to five. With CamQuest, children can search and photograph geometrical shaped objects around them and learn more about geometrical shapes. According to Berggren and Hedler, mobile application design for children should be open-ended in a way that it should not force collaboration, even though collaboration is a valuable aspect in a mobile application [15]. Hence, there should be autonomy to some extend when using mobile applications, in order to keep children engaged. Throughout their work they co-designed the application with children, which turned out to be very useful as they were able to close the gap between digital
immigrants and digital natives, and understand needs of children better [15].

Aziz focused on gestures such as tap, drag-and-drop, slide, pinch, spread, rotate and flick in mobile applications and investigated how children interact with these gestures [14]. In the results, two years old children were able to tap, slide and flick on the touch screen [14]. Drag-and-drop and pinch gestures was not easy or possible for children that are very young [14]. Therefore, when designing a mobile application, considering the gesture types and their appropriateness to target age is important as well as the other design dimensions that are mentioned above.

2.3 Photo Taking and Sharing Interaction

Photos are shared among people for different purposes. Voida and Mynatt found six themes for communication with photographic images, which are amplification, narrative, awareness, local expression, invitation and object/instrument [43]. Hence, communication can be enhanced with photos to visualize and make things more concrete.

There are a lot of work done for photo interaction at museums. Weilemann et al. investigated on how Instagram is used for communication among visitors for their experiences in a museum [44]. They analyzed 222 Instagram posts and conducted 14 interviews with visitors who created these posts. From their findings, they concluded that the visitors’ dialogue is extended beyond a museum’s physical location. Hence, social interaction is supported with a mobile technology in the museum. [44].

Another work for museums is a school trip “photomarathons” where students visit a museum and take photos on three themes around the museum [19]. There were 60 primary school pupils in total who were divided in groups of three. At the end of the photomarathon, each group handed in one photo for each theme, then they voted for the best photo. The aim of this activity was to help students relate what they learn in their history lessons with what they learn during a museum visit in a more engaging way [19]. Students shared that they had fun due to having a technological aspect and competition, instead of having a typical museum visit. Therefore, photo taking activity can also be used to enhance learning [19].

Sturms et al. designed a mobile application called Photo Quest which is a game aimed to be played by people that have to wait for some time, at a train station or a meeting point while waiting for a friend [38]. The application shows a blurred image of an object. The aim of the application is to find the object and its location and then, reproduce the photo. The users collect points according to how fast they find the object and the location, so there
is a competition with other users. The overall aim of this application was to stimulate physical activity in public spaces [38].

Blömer et al. came up with a collaborative photo sharing experience, which they called “4Photos”, on a dinner table and enabled “phototalk” on it [39]. 4Photos is a multi-screen centerpiece placed on a dinner table and photos are presented on it, so that photos support communication. Their qualitative findings states that this centerpiece could be a conversation starter and aid communication [39].

Nowadays more comprehensive mobile applications are commonly in use such as Instagram⁴. There are not many previous work done on sharing photos for playgrounds. This thesis focuses on taking photos and sharing them in playgrounds.

2.4 Playgrounds and Technology

Recently, “Interactive Playgrounds” emerged, which includes technology-integrated playground equipment with built-in games in them. Among recent research findings, Sturm et al. suggested that when designing an intelligent and an interactive playground, key issues consist of social interaction, simplicity, challenge, goals and feedback [37]. Social interaction and simplicity are the issues that will be focused in this project and will be elaborated.

Having technology-enabled everyday objects increases expectations of children and this may put traditional places out of use, such as traditional playgrounds. As Tetteroo et al. also discussed, children would like to spend time playing computer games rather than outdoor games [40]. A playground is a free play environment where children can create their own games and a simple use of technology might motivate children to play there [40].

Tetteroo et al. came up with a taxonomy for playground-play in three layers; classes, dimensions of play and playground interactions. The top level of the taxonomy is classes which are about social interaction and the gamespace that the play takes place. The intermediate level is dimensions of play, which could be competition or collaboration. The bottom level is playground interaction which is the way playground interacts with present players. Tetteroo also expanded “Gamespace” concept in the top level, which defines the extend of relation between the play environment and the play. These measures are fully external, partially contained and fully contained [40]. In this thesis, the playground environment is considered to be partially contained as the game or sharing photos is not depending on the playground, but the equipment are partially used to enhance the activity.

⁴https://instagram.com/
There have also been some attempts to transform traditional playground equipment into technology-enabled ones. Soler-Adillon et al. designed and implemented an “Interactive Slide” with the aim to improve physical activity, since children prefer to stay home and would like to spend time interacting with technology such as TV or computer games [34]. The Interactive Slide is an inflatable slide and requires constant flow of air to keep its shape. Children played “the virtual mosaic” game where they play with shapes and colors while sliding. As their finding, they observed that children had very high attention to the slide and the platform increased their physical activity [34].

As for mobile applications for playgrounds, the variety was very limited, and their aim was usually informing about locations of playgrounds on a map view and in some cases provide additional information. There were three applications for playgrounds that were noticed during the time of this study and these were Lekplatsen Göteborg⁵, Lekplatsen⁶ and Lekplatser⁷. Thus, there seemed to be a lack of mobile application which would enable social interaction among people who go there.

⁵https://itunes.apple.com/se/app/lekplatsen-goteborg/id646339547?mt=8
⁶https://itunes.apple.com/se/app/lekplatsen/id652813548?ls=1&mt=8
⁷https://itunes.apple.com/se/app/lekplatser/id617069965?mt=8
Chapter 3

Methods

In this thesis, there are three main methods that were used. These methods consist of: (1) a pre-study to get acquainted with playgrounds and needs of targeted people, (2) design exercise where a prototype was created and mobile application was implemented and (3) a user study where people at Pelle Svanslös playground were interviewed.

A pre-study was conducted and various playgrounds of different types such as traditional, technology-enabled and thematic were observed. Potential parks were Nydalsparken and Humlegården Park in Stockholm and Pelle Svanslös Playground in Uppsala. Parents’ engagement and interaction with their kids were also observed, since some parents might be busy with their phones rather than their kids. People often feel more connected to a space when they have their belongings with them. Hence, whether children bring home artefacts, such as toys and sand buckets, with them to their playgrounds was observed.

After the pre-study, prototype of the mobile application was created and reviewed through several iterations of design workshops. The mobile application was implemented and tested at a playground with parents and kids. Data were collected from instrumenting the application and interviewing users who tested the application. Personas were created according to the collected data to identify different types of users. Ethical considerations such as anonymity, control of data, and ownership were taken into account. The results were analyzed and evaluated to draw conclusions, which were later interpreted to propose improvements to the mobile application design and also for future research.

Throughout the project, design thinking approach was adopted. Tim Brown first defined Design Thinking as “... a human-centered approach to innovation that draws from the designer’s toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business suc-
Design thinking approach has an iterative development cycle, which enables it to be flexible to turn back and make changes. This approach is user-centered which takes possible users’ needs into consideration.

There are alternative approaches and models to Design Thinking such as User-Centred Design (UCD) [3]. The life cycles of both are similar but the focus on UCD is on the requirements to solve specific problems according to [5]. In design thinking, rather than starting with a specific problem to solve, a goal is defined first, where a better future situation is aimed. Stigberg defines five phases of design thinking as: Empathy, Define, Ideate, Prototype and Test [36]. These phases will be iteratively applied.

As it can be seen from the figure, it has five phases, which are:

- **Empathy**: Learning about the audience,
- **Define**: Defining the focus,
- **Ideate**: Coming up with possible solutions,
- **Prototype**: Building one of the solutions,
- **Test**: Testing the ideas and get feedback from users.

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user needs, whereas in design thinking, instead of solving a specific problem, the focus is on a goal to make one situation better [3]. In this project, there is no specific problem in playgrounds but rather the goal is to improve communication among parents and children. Hence, different ways of achieving this goal were investigated with Design Thinking approach.

3.1 Pre-Study

The pre-study involved Empathy, Define and Ideation phases of the Design Thinking approach, Figure 3.1. Empathy phase is observing playgrounds and learning about people that go there. In Define phase, focus was on social bonds and interactions in playgrounds. Ideate phase, the proposed solution was a mobile application to share photos in playgrounds and navigate through different playgrounds.

Different kinds of playgrounds were observed in order to understand more about the environment and patterns in the actions of the park-goers. Three parks were chosen to be observed according to their types, which are technology-enabled (Nydalsparken playground in Stockholm), traditional (Humlegården playground in Stockholm), and thematic (Pelle Svanslös playground in Uppsala). The pre-study was conducted in winter and due to bad weather conditions there were very few people, but the outcomes of the pre-study were sufficient to proceed with the study.

3.2 Design Exercise

After the pre-study, a prototype of the mobile application was built to visualize the mobile application. Then, the mobile application was implemented and according to feedback from expert-based testing, it was improved. This stage was considered to be the Prototype phase of the Design Thinking approach, Figure 3.1.

3.2.1 Prototyping

Prototyping is a way to visualize initial design decisions before implementing an application. There are two types of prototypes which are low-fidelity and high-fidelity. Low-fidelity prototype is paper based prototypes. It is useful to sketch ideas with pen and paper quickly, when there is not enough time. High-fidelity prototype is computer based, clickable prototypes [11]. In this project, high fidelity prototype of the mobile application was constructed.
The purpose of the prototype was to visualize and improve missing points of the mobile application at the initial stages of the design process.

NinjaMock\(^2\) online prototyping tool was used to create the prototypes of mobile application. NinjaMock is an easy to use prototyping tool which provides free stencils to build interactive prototypes. It offers ready to use icon sets and interface components. Moreover, images from the Web, own image files and manually drawn icons can also be embedded into prototypes. Interactive prototypes which enables navigation and are clickable can be created in Ninjamock.

### 3.2.2 Expert-based Testing

Expert-based testing is a process, where interface experts inspect an application and evaluate its usability [24]. The mobile application was reviewed by the supervisor and some of his colleagues who have experience with mobile application design. Cognitive walk-through of the application was made, where experts simulated being a user and went through the steps to accomplish tasks in the application. There were two different expert-based testing sessions with different experts. At first, the mobile application was presented to the expert, who tested it on his own and mentioned about flaws and improvements. At the second session, the supervisor tested the mobile application without prior demonstration and acted as a naive user that uses the mobile application for the first time. According to the feedback from these sessions, the mobile application was revised and changed for a better design. The aim of the expert-based testing was to find flaws in the interaction, the layout and the color consistency. After the expert-based testing, the most prominent change was to remove most of the text from the interface, so that children would be less distracted. Expert-based testing was very useful as it helped seeing different aspects of the mobile application from different and more experienced point of views. As it is mentioned in Lazar’s book, the expert-based testing should be done by someone who did not develop the mobile application, as it is usually the case that developers might miss some details and the results could be biased [24].

\(^2\)http://ninjamock.com/features
3.3 User-Study

In order to test the mobile application and get views of parents on mobile technology use in playgrounds, user studies were conducted. Interviews and online survey were done to collect data. Personas were created to visualize the results and use cases of the mobile application. User-study was considered as the Test phase of Design Thinking approach, Figure 3.1.

3.3.1 Data Collection

A combination of offline and online data collection methods were used to reach a large portion of the target population [24]. All participants were parents that were at the Pelle Svanslös playground, who were suitable targets for the study to get perceptions on the role of mobile technology among children in the playground. The participants were considered in two separate groups and the plan was to compare responses from different groups to discover different views.

Group 1: Parents at Pelle Svanslös playground

People from this group were chosen randomly on-site at Pelle Svanslös playground and at different times. Data collection was done by pen and paper. An informative brochure, Figure 3.2, was prepared for participants, who might not have had time to take the on-site interview, so that they can take the online survey. Eight parents were interviewed on-site and their perceptions on both the issue and the solution were collected. The interviews were semi-structured that had flexible and easy to adapt questions according to participants’ responses. Hence, some participants were asked follow-up questions for clarification according to their responses. Moreover, the interview had both open-ended and statistical questions. There were also contingent questions where a question is followed by another one to get a deeper understanding on the matter [24].

Group 2: Parents from Instagram

An online survey, Figure 3.3, was also conducted for parents who had been in Pelle Svanslös Playground and already using a photo-sharing application. The online survey contained the same set of questions as in the interview and published by using Google Forms. The Instagram users, who were sent messages to participate in the online survey, were found by following #pellesvanslös and #pellesvanslösparken hashtags. The participants were informed about the study and were provided a web link that directs to the online survey. There were responses from two people out of forty-five,
who were invited to participate in the online survey.

Informed Consent: Participants were informed about the study before the interviews and it was made sure that they understood the reason for conducting the study. They were also mentioned about how they can get more information about the study by given contact information [24].

### 3.3.2 Data Analysis

Grounded theory method was used to analyze the collected data. In contrast to experimental approach, which is based on an initial hypothesis, grounded theory method is based on empirical observations and explorations [24]. In experimental methods, the data is usually quantitative and hypothesis is validated with quantitative results. When analyzing qualitative data, a systematic approach such as grounded theory would be more fruitful.

Lazar et al. stated in the book that grounded theory method has four steps which are; open coding, development of concepts, grouping concepts into categories and formation of theory [24].

The results from interviews were analyzed and concepts were coded into categories, which was done manually as the number of responses was limited.
Role of technology in social interactions in public playgrounds

* Required

Parent related questions

Do you take photographs when you are in a playground? *
- Yes
- No

If yes, what photos do you take?

Figure 3.3: Online survey

Researcher-denoted concepts and in-vivo codes were used as the source of coding categories that Lazar et al. mentioned in their book [24]. Researcher-denoted concepts is also called open coding, which comes from the researcher’s own interpretations while defining categories [24]. The category name should describe the general theme for the group it represents. In-vivo coding is using the exact term that a participant mentioned, since it describes a category precisely.

In order to maintain data validity, the responses from interviews were stored and documented as raw data in an Excel sheet and were consulted as needed throughout data analysis step. Afterwards, the responses were visualized in graphical format as pie charts.
3.3.3 Mobile Application Trial

Even though the focus was on the interviews, the developed mobile application was tested by two participants at the Pelle Svanslös playground. Their interactions and behavior while using the application were observed and analyzed. The targeted user group would be parents and their children aged between four and ten. This age span is chosen conforming to cognitive skills and needs of children for the mobile application.

Ad-hoc Provisioning\(^3\), which allows up to hundred users to beta-test an application, was used in the study. By this way, the mobile application can be installed on other mobile phones. It has advantages over publishing the application in the App Store by being more suitable for researchers and eliminating the need to wait for approval from the App Store. Therefore, a link to download the mobile application was created and distributed to parents at Pelle Svanslös playground in Uppsala on the given brochure, Figure 3.2.

3.3.4 Persona

After analyzing the collected data from interviews, two personas were created to understand and visualize use cases of the mobile application. A persona represents a person that is supposed to be involved in the system as a user. Blomkvist defines it as “A persona is a model of a user that focuses on the individual’s goals when using an artefact.” [16]. Persona focuses on users and their needs, which makes the design process user centered in the long term. Therefore, personas may lead to better design decisions.

Nielsen listed four types of personas in the literature which are: goal-directed, role-based, engaging and fiction based personas. While the first three base the persona on collected data about users, fiction based persona is based on designers’ assumptions [9]. A persona can be described in terms of a scenario which includes a character, a problem, setting of the problem and the resolution to the problem.

\(^{3}\)http://tinyurl.com/nmskkfy
Chapter 4

Results

In this section, results from pre-study, design exercise and user studies will be presented.

4.1 Pre-Study

In the pre-study, three different types of playgrounds were observed which are Nydalsparken, Humlegården and Pelle Svanslös. Having a variety of playgrounds aided in the creation of a mobile application concept. Each of the playgrounds had different aspects to investigate. Consequently, Pelle Svanslös playground was chosen for pilot study location.
4.1.1 Nydalsparken playground

Nydalsparken is an interactive playground with technological equipment which is located in Stockholm. The park has technology-enabled playground artifacts which aims children to be more active and interact more with each other. Equipment in the playground are provided by Kompan\(^1\), which produces interactive playground solutions. There are buttons and displays on the park equipment and pre-installed games are available in some of them. At the time of observation, there were not many children playing at the park. Hence, discussion based on the observation is not applicable. However, it is possible that bad weather conditions might have affected the presence of people at the playground. Views from the park can be seen in Figure 4.1.

\(^1\)www.kompan.se

![Nydalsparken playground](image)

Figure 4.1: Nydalsparken playground
4.1.2 Humlegården playground

Humlegården playground, which is a traditional playground in Stockholm was observed. Although the weather was rainy at the time of observation and the playground was muddy, it attracted many people probably due to being in a central location. There were two groups of people in the playground. One group was individual parents and their children. The other group was children from day care center with their supervisors. While some parents were engaged in the plays of their children, others were busy with their phones and did not pay attention to their children. Parents interacted with other parents and their children played together from time to time. This park seemed to attract younger children compared to Nydalsparken, which could be a result of being a more simple park. Views from the park can be seen in Figure 4.2.

Figure 4.2: Humlegården playground
4.1.3 Pelle Svanslös playground

Pelle Svanslös playground which is a thematic playground in Uppsala was observed. Three short and semi-structured interviews were conducted with parents in order to get an insight of their needs and thoughts. All parents said that they would make use of a photo-sharing mobile application that is specific to a park.

In Pelle Svanslös playground, many parents were taking pictures of their kids with the thematic cat statues in the playground. Therefore, Pelle Svanslös Playground was chosen as the location for the pilot study. Views from the park can be seen in Figure 4.3.

Figure 4.3: Pelle Svanslös playground
4.2 Design Exercise

As observed in pre-study, a common activity of parents was taking photos of scenes at the playground; so it was decided to design a mobile application to take and share photos in playgrounds. Results of the design exercise phase include a prototype of a mobile application and its implementation on iOS platform.

4.2.1 Prototype

Considering the results from pre-study observations, a prototype of a mobile application was constructed. With the mobile application, children would share pictures and communicate with each other by “phototalking” [39]. Simplicity and consistency were given importance in the prototype. The prototype had several iterations up to the final version and now the views of the latest prototype of the mobile application will be presented.

In the mobile application, users would get up to date photos that would be shared in a specific playground. The drop down menu in Figure 4.4a would allow choosing a park to filter photos. In the map view, as shown in Figure 4.4b, nearby playgrounds would be shown. Therefore, parents may be aware of nearby playgrounds and try different parks. The pin on the map for a specific park would give a brief information about the referred park such as number of shared photos.

In the share view, as shown in Figure 4.5, users would take a photo and share it with others. Photo taking and sharing activity would be taken in three steps in order to make it easy to follow. The first step would be to take a photo or upload an existing photo. The second step would be to write a text or record a voice note or a short video to describe the photo. The last step would be tapping on the check mark to share the photo.

4.2.2 From Prototype to Mobile Application

As it can be seen from Figure 4.6 and 4.7, there are some changes in the mobile application compared to the prototype, Figure 4.4 and 4.5. After several iterations of expert-reviewing of the application, some features were added or removed for better usability. The changes resulted in a more intuitive design that requires less steps to accomplish tasks. For instance, the task to take a photo was too complex for a child, now the child only needs to take the picture and it will be automatically shared and shown in the Feed view, Figure 4.6a. Hence, sharing a photo can be done with minimal number of steps. Children are less patient and have shorter attention span than adults,
thus it would be better to accomplish things faster. When the photo is taken and the Done button is pressed, the photo is automatically shared and can be seen from the Feed view, Figure 4.6a. Considering the scope of the project, only the most prominent and useful features were implemented. For instance, video recording and adding text were left out. The text description of a photo was not implemented since the intended user group are generally unable to read or write due to young age. The colors and figures from the prototype were developed in a way that children might like and understand more in the mobile application.

The initial design of the mobile application had feedback for each step that is taken. For example, when the child took a photo, the mobile application
presented a message about the success of sharing of the photo. However, as mentioned earlier, feedback can mean one more step to take, such as confirmation of the feedback. Since small children with limited literacy levels are only aware of the visual activities in the mobile application, the feedback was eliminated and an intuitive approach was taken. Rather than having “The photo is shared.” feedback, the user is directed to the view that shows the feed and the shared picture. Consequently, even though feedback is an important design guideline, it may not be useful or even make things more complex for some cases. Feedback should be intuitive and not interfere with the flow of the application.

4.2.3 Mobile Application Development

The mobile application was first developed as an isolated application. As the application started to take usable shape, the application was taken to a
mobile phone that had to be connected to a system to function properly. In this subsection, details related to these activities will be mentioned.

**Platform**

For the mobile application development, iPhone 4S was used. The operating system was iOS 8, which was the latest one during the development phase. This was important as new features of iOS 8 was used such as the camera module which allowed taking square shaped photos for better layout in the feed view, Figure 4.6a. Furthermore, the latest operating system enforces use of up-to-date versions of the components in order to achieve better com-
patibility when developing a mobile application.

**Development Environment**

The integrated development environment (IDE) for an iOS mobile phone is XCode. The version of the IDE when developing the mobile application was XCode 6. Using the most recent version of IDE matters when maintaining the mobile application as obsolete method use can cause compatibility issues.

XCode’s Interface Builder was used to build the mobile application. Figure 4.8 shows Interface Builder which allows visualization and construction of application interfaces.
At the initial states of the implementation, iOS Simulator was used to test the mobile application’s functionality in isolation. However, since it was not possible to take a photo with the simulator, the IDE was connected to an iPhone to use the mobile application’s entire feature set.

**Programming Language**

Objective-C was used as the programming language to develop the mobile application. Objective-C derives its roots from C programming language.
with object-oriented capabilities. In terms of syntax and primitive types it is similar to C but objects and methods can be created as well [1].

**System Design**

![System Design Diagram](image)

Figure 4.9: System design [2, 6, 7, 8, 10, 12]

Once the mobile application was taken on a mobile phone, it was necessary to have a working system that included the mobile aspect as one component. The other components were a web server and a database. Simply put, the mobile application retrieved the photos from the web server via their URLs, which are stored in the database.
Web Server
The web server was based on two major tools that were JSON\(^2\) and PHP\(^3\). JSON was used to represent data structures between a client (mobile application) and the web server. The data from the mobile application needed to be sent and received in JSON format to be compatible. PHP is used for the web connections and also queries to the database.

The Web Server resources were provided by SICS\(^4\) and Mobile Life Centre\(^5\).

Database
For implementation and management of database, MySQL\(^6\) was used. The database stored the photos with their titles, and URLs for their image and audio files.

4.3 User-Study

Eight parents were interviewed at Pelle Svanslös playground in Uppsala. The interview consisted of questions for parents and children. There were both statistical and open-ended types of questions. The participants were interested in the questions and they gave detailed answers for the questions. The interview questions can be found in Appendix A.

Forty-five Instagram users were invited to participate in the study via direct messages that were sent to them. However only two responses could be collected. Non-responding users might have not seen the message or neglected the message as they have not recognized the sender. Considering the scarcity of the responses from Group 2: Instagram users, the focus of the data analysis will be on results from Group 1: people at Pelle Svanslös playground.

Considering time limitations, the mobile application trial is kept as future work since not all participants had iPhone, so the focus was on interviews.

4.3.1 Data Analysis

Due to the scope of the project and insufficiency of collected data, grounded theory method, which was mentioned in Chapter 3, was used as a coding technique and not as a theory generation method. The grounded theory

\(^2\)http://www.json.org/
\(^3\)https://www.php.net/
\(^4\)https://www.sics.se/
\(^5\)http://www.mobilelifecentre.org/
\(^6\)https://www.mysql.com/
method has open coding, development of concepts, grouping concepts into categories and formation of theory steps. However, in order to generate a reliable theory, each concept needs to be backed up by enough number of samples. Results from open-ended questions were analysed to find patterns, and meaningful categories were formed according to grounded theory method.

4.3.2 Parent-related Results

The results of questions related to parents are presented here.

Taking photo at a playground

Six of the parents take photos when they are at a playground. Two of the parents take photos seldom.

![Pie chart showing the results]

Figure 4.10: Taking photo in the playground
Photo variety

The variety of the photos that parents take are of the child and the environment. Some parents take photo of both of them. One interesting comment from a participant:

“I take photos of the park environment, because it reminds of my childhood. I grew up here and want to have memories”

Therefore, people may take photos of places to collect their memories.

Use of social media

Half of the participants uses social media while the other half does not use any.
Variety of applications

Among the used social media, there are a variety of applications. Four participants use Facebook, one participant uses Instagram and one participant uses Twitter. The remaining two participants do not use any social media applications.

![Variety of applications](image)

Figure 4.13: Variety of applications

Ways of place-finding over the Internet

Participants find a place over the Internet in three different ways. Three participants find places using Google, two participants ask their friends about the place and the rest uses both.

![Ways of place-finding over the Internet](image)

Figure 4.14: Ways of place-finding over the Internet
Ease of place-finding

There was a tie between hard and easy about finding a place where three participants said hard and other three participants said easy. One participant said he/she does not know and the other one said it depends on the place.

Figure 4.15: Ease of place-finding over the Internet
Parents’ thoughts on photo-sharing applications

The following are categories for the question that asked parents for their thoughts on photo-sharing applications and their implications:

- **Non-users**
  Participants in this category do not use any social media mainly because of privacy reasons. As a participant mentioned
  “I dislike social media, it is against privacy and some people do not have rights to see my photos.”.

- **Familiar-zone**
  The participants in this category use social media but only among family and friends. Therefore their profiles are not open to public and only people that they allow can see their activity. One participant said
  “I share photos with friends that are far away.”

- **Photo-power**
  The participants in this category use social media and they share photos publicly. Some people think that it is easier to express feelings with photos, and discussions can be deeper. A participant mentioned
  “Discussion happens with photos and sometimes one photo can mean hundred words.”.
  Therefore, the name of this category comes directly from a participant’s own words, which makes it in-vivo coding.

- **Sociables**
  People in this category think that social media applications create a great way to socialize, especially with people they do not know. One participant said
  “It is good for people that are new to a place.”
  These type of people also think this is a fun activity.

- **Real lens**
  Participants in this category think that they have chance to see real perspectives from real people about locations. One participant said
  “While choosing hotels for vacation, instead of hotel’s show-off pictures, I use social media and hash-tags. This way I can see how the hotel really looks like and the profiles of people that go there.”
4.3.3 Children-related Results

The results of questions related to children are presented here.

Age range of children

The age of participants’ children ranged from 1 to 13. Most of the parents had a 6 years-old child.

![Age range of children](image.png)

Figure 4.16: Age range of children
Use of mobile technology

Among thirteen children, only one nine-years-old child did not use technology. While one and two years-old children use technology, nine-years-old child does not use it. Hence, this might mean that age is not the only factor to determine the use of mobile technology among children.

![Figure 4.17: Use of mobile technology](image)

Ownership of mobile technology

Most children used their parents’ mobile technology. Two of the children had their own mobile phones or tablets.

![Figure 4.18: Ownership of mobile technology](image)
Variety of applications

There were a variety of applications that children use. Video application (YouTube, Netflix and TV channels) was the most common one. Game application was the next commonly used application. Some children used mobile phones only for communication application such as Skype and/or phone calls.

Figure 4.19: Variety of applications
Level of help when using technology

Half of the participants mentioned that their children needed help while using technology in order to accomplish certain types of tasks, such as turning the mobile phone on and downloading applications. One participant said “I help one time and they got it.” which shows that children can get acquainted with technology easily.

![Pie chart showing level of help when using mobile technology]

Figure 4.20: Level of help when using mobile technology

Taking photo with mobile technology

According to results, not many children use mobile phones to take photos. Children, who take photos, take selfies or photos of interesting objects or home.

![Pie chart showing photos taken with mobile technology]

Figure 4.21: Taking photo with mobile technology and variety of photos
Interaction with other children

The following are categories for interaction among children in the playground:

- Kindergarten friendship
  Children in this category have friends only from kindergarten or school. They do not have many friends from playgrounds. One parent, who has a two-years-old child, mentioned “She is too young to make friends at the playground.”.

- Siblings
  Children in this category have siblings and they prefer to play together at the playground.

- Playground friendship
  Children in this category play with other kids in the playground and they even become friends in the long term. One parent said “My child tries to interact and play games together with other kids at the playground and they become friends.”.

- Too shy to play
  Children in this category do not interact with other children and they play alone, unless another child approaches to them, hence they are a bit shy. One parent said “He is a bit shy at the beginning but when someone approaches him he socializes well.”.

4.3.4 Results from Instagram users

Responses of Instagram users were similar to responses of people at Pelle Svanslös playground. They used Instagram and other photo-sharing applications for family and friend communication. One participant said “Photo-sharing applications are good conversation starters with friends.”.
4.3.5 Personas

The personas were formed according to participants’ profile. During the formation of profiles, both parents and children were considered, as there were different views and needs. The personas aided in visualizing different use cases of the mobile application for different user groups.

Parent Persona

Parent persona explains a parent who likes using and benefiting from technology. This persona represents one use case of the suggested mobile application.

Tech-savvy Daphne

Daphne is a mother of a 6-years-old son. They have a family iPad that everyone uses at home. They usually go to a nearby playground. However, her son is bored of that playground and wants to see different playgrounds with interesting themes and different settings. Daphne sees that a new playground is built somewhere in the town but she does not know if it is worth going there. She checks how it looks from the Internet but she can only find limited information about the new playground. Daphne installs a mobile application where she can locate and get more information about that playground. She can also see some photos that people shared when they were in the playground.

- Mother of a 6-year-old son
- enjoys playing games with her son on iPad
- Problem: Finding information about a newly built playground
- Resolution: Using a mobile application to locate the playground

Figure 4.22: Parent persona
Child Persona

Child persona represents a child with a possible use case of the suggested mobile application. This persona is based on the results from interviews with parents and also inspired from McPake’s results where a child at the age of 3 is mentioned as a photographer and how he interacts with his relatives living far away by photography [25].

Photographer John

John is 5 years old. He likes to explore around and take photos. Flowers, nature and toys are some of the objects that he likes the most to take photos. He would love to share these photos with other people but he does not have the opportunity. He does not know of an application that he could use and even the most famous photo-sharing application Instagram does not allow him to have an account. He finds a new mobile application that is designed for his favorite playground, where he can take photos and share them with other children in the playground. He uses the application with his mother and he gets to know other children who are interested in photography!

Personas described in the literature usually focus on single user. For applications where the user could be multiple (parent-child), it would be better to have a mixed version in persona scenario with both parent and child relationship, and their interaction with the application.

**Photographer John**

- 5 years old
- **Enjoys** taking photos and exploring new places
- **Problem:** Sharing photos with other people and find other children with photography interest
- **Resolution:** Using a mobile application to communicate and share photos

Figure 4.23: Child persona
4.4 Discussion

In this section, interpretations and implications of the findings will be discussed. As seen from the results of interviews, categories were formed from the responses of the open-ended questions. These categories were formed according to patterns and different themes in the answers. Some categories were named with exact sayings of participants as it described that category very well, which is called in-vivo coding of categories.

Participants had different ideas on the effects of photo-sharing applications. While some participants were totally against using them, others found these applications totally beneficial. This shows that people have different goals and choices for technology and there is no common idea on the effects of technology. People are exposed to technology at different levels and some people have prejudice against it. Some of the interesting aspects of the results will be elaborated below:

Privacy and Security

Privacy is a prominent concern among participants. Most people do not want to share their confidential information. Therefore, emerging technology should focus on granting autonomy to users, where they can control the level of disclosure of information in a social media environment.

Security, which is an important aspect in mobile applications, could be a reason for some parents and children to avoid technology. Some suggestions will be given as future work for a more secure application.

Memories

Some participants mentioned that a mobile application to share photos in the playground could be a nice way of collecting old memories. A participant stated that such a mobile application could enable screening current state of remote playgrounds where he grew up and played. He added

“It would be a chance to look back in the past.”

Children and taking photos

From the results it can be seen that taking photos is not very common among children. The reasons could be because there are not many mobile applications for children to take photos. Even the most popular photo-sharing application Instagram does not allow children below age of 13. The rationale behind the age restriction could be that they do not want to take the risk of children seeing inappropriate content. Moreover, children could of

course take simple photos and store but barely taking photos does not arouse
their interests. As Sturm et al. mentions, challenge is one of the important
factors for children to be engaged in an interactive tool [37]. In the interview
results, there are not much variety of photos that children take, because they
are not challenged. A mobile application to take variety of photos could be
a chance to improve their exploration and creativity skills. The structure of
such a challenge should be pedagogically suitable though.

Apart from the aspects discussed above, there are several issues to address
in the case of extending the design of the current mobile application:

- Who should be able to write to / read from the data store in the system?
  Permissions become more crucial for an application used by children

- How should the system and the content be controlled against vandal-
  ism? For instance, against misuse of the system by putting irrelevant
  pictures.

- Should it be possible to access the system remotely? Why and with
  which constraints?
Chapter 5

Conclusion

In this study, the impact of technology on children and parents, and its use in playgrounds were investigated. Therefore, this study serves as an initial understanding for the role of mobile technology in children, parents and social interactions at playgrounds. This study also suggests a model of an interactive photo-sharing mobile application to be used in playgrounds and perceptions of parents for this application.

The results of interviews showed that there are different beliefs and perceptions among parents on the impact of mobile technology on social interactions. Some parents were in favor of using mobile technology by their children as it aids communication and it might be fun. On the other hand, some parents were against using technology in playgrounds since they wanted their children to focus on physical traditional play rather than interacting with mobile phone. Hence, these instances should be taken into consideration and future designs should be shaped accordingly. For instance, an application should allow or even motivate children to move and explore rather than interacting with a screen without a movement.

Parents’ thoughts on photo-sharing applications and its effects on communication led to five different categories and use cases. These categories are non-users, familiar-zone, photo-power, sociables and real-lens. The categories were classified according to the level of interaction with photo-sharing applications. Another categorization was made for social interaction of children at playgrounds. The categories for this theme are kindergarten friendship, siblings, playgrounds friendship and too shy to play. The categories were formed according to the level of interaction among children in the playground.

Analyzing the work that have been done before in the literature and from feedback of participants in the study, some design implications are in the foreground. For instance, use of audio and visuals properly in a mobile application for children is very crucial to reach their needs and levels. More-
over, Plowman’s guided interaction concept, where children are guided by their relatives, play a huge role in the constructive and positive interaction with mobile technologies [29].

Technology may have harmful consequences but the level of awareness of technology users about such harms and dangers should be high enough to avoid those situations. In order to overcome the negative effects of using technology for children, being aware of the harms and taking counter action is important to benefit as much as possible from technology. There should be a balance on the use of technology and parents play a big role to guide their children in order to avoid overuse and addiction. Lastly, in order to get higher benefits and use, it is also important to make similar feasibility and public opinion studies before implementing a technology for unusual design spaces.
Chapter 6

Future Work

The starting idea of this study was to have a situated display and a swap corner in a playground, where children and parents would share photos and socialize both on-site and from a remote place such as home. However, due to several limitations such as time and scope, a little part of this idea could be implemented. Recommendations for possible follow-up work from different perspectives are listed below.

**Setting of the study**

The location of the pilot study was Pelle Svanslös Playground which is in Uppsala. For future work, different types of parks could be added to compare the effectiveness of a mobile application to improve social interaction. For instance, Pelle Svanslös Playground is unique in a way that it has a theme of a well-known fictional cat character and is different from traditional playgrounds, which provides more instances to take photos of interesting artifacts. Including more playgrounds would also allow the notion of “connecting parks”, thus people from distant parks would have a chance to interact with each other.

**Methodology**

Alternative methods to interview and online survey might enhance the outcome to be more detailed and diverse. For instance, having focus groups with less number of participants but more detailed discussions about the issue could be considered.

The focus of this study was not purely on the mobile application for the playground, but rather a design exploration. As a future work, usability testing method could be performed thoroughly with concrete scenarios for a better design. Moreover, “tech probe”, which is a methodology that is becoming more popular could be used to get a comprehensive insight from
the prospective users of the application. Hutchinson et al. proposed this method, where the technology is installed and the use of it is observed over time in order to get to know more about the users and also different use cases of the technology that is probed [21].

Due to time limitations, focus was on parents to get a higher level of perception on the issue. In the following studies, children can be included directly in the design process as well, so that children would be involved in the interviews and participatory design exercises. Including children in the design process would allow understanding their needs better.

**Mobile Application and Technology**

Since the current mobile application represents the initial idea only, there could be numerous improvements. In terms of design, it could be more guiding about its features such as a voice recorder indicator which notifies about recording when selecting the tab to take photos.

Children enjoy playing, thus the application can also be advanced to be more playful with different additions. In conjunction with guidelines by Chau that were mentioned in Chapter 2, a narrator, which is naturally Pelle Svanslös for this pilot study, could be used to guide through the application and also tell stories of himself. Apart from telling stories, the application could also be used to form stories in the park, where children collaborate with each other. This would support social interaction in a more playful and meaningful ground. Another way of improving engagement when using the mobile application is applying an achievement system as Montola et al. found in their study that such a system would enhance user experience. However they also found that users should be able to opt-out from this system since not all users might like an achievement-based system [27].

Furthermore, current mobile application is implemented for iPhones only. Other platforms such as Android and Windows Phone should be considered to reach more participants. In this study, the participants with iPhones were quite few and as a result, participation in the trial of the application was low. The application is open-ended, so there is no personalized profiles or accounts. Ability to create a profile and being able to delete own photos would be more useful. Moreover, the mobile application does not have any precautions for security and privacy, except the fact that shared photos are anonymous. For a more personalized application, security and privacy aspects need to be taken into consideration especially for children. One level of security could be enabled by using beacon technology. Beacons such as Estimote could be used to force authentication, which uses Blue-
tooth technology. Additionally, another possible beacon use is prompting to give notifications from the application such as “5 new photos added”. The chosen technology should endure the winter conditions such as being cold and water proof. Estimote, which is a potential technology for location sensing, is water proof and can work normally down to -10 degrees Celsius. However below -10 degrees, its battery consumption increases drastically [4]. Bluetooth can also be used for location-awareness and device to device communication among users without depending on another technology such as Internet. Mesh networks and opportunistic networking could be considered as extensions to enlarge the communication area when the users are far away from the meeting location. These technologies could also allow to incorporate Internet connectivity to the whole system at different times and places.
Bibliography


Appendices
Appendix A

Interview/Survey Questions

A.1 Parent-related Questions

- Do you take photographs when you are at a playground?
  - If yes, what photos do you take?
- Do you use Instagram or any other similar photo sharing applications?
  - If yes, please write the names of the applications. Do you share photographs in these applications?
- How do you find different places to go over the Internet?
- Is it easy or hard to find a photo of a specific place over the Internet or through a mobile application?
- What do you think about photo-sharing applications and their effects on communication?

A.2 Child-related Questions

- How old is your child / children?
- Does your child use mobile phone or tablet?
  - If yes, does she/he own a mobile phone or use yours?
- What kind of mobile applications does your child use? Any social media applications?
• Do you help your child when they are using mobile technologies?
• Does your child take photos with mobile phone?
  – If yes, what kind of photos does she/he take?
• How does your child interact with other children in the playground? Does your child play with or talk to other children in the playground?