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MOBILE LEARNING CONCEPT FOR PARENTING

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ABSTRACT

Communication has become easy in terms of texting, calling, video calling, and social networks through smart devices. Smartphones have become the solution to most problems of everyday life and information searching has revolutionized. This includes cooking, traveling, home decorating, job finding, shopping. In contemporary life, people are often surfing on their mobile phones or searching for a new application to do a specific task for them. Hence, mobile applications become popular in almost all fields and social entities. Parenting is a social activity that deals with child educating, caring, and supporting. Therefore, parents must be aware of children's development processes and their needs at various stages of the childhood. Parenting itself is a learning process for parents.

The focus of this study is to investigate Finnish parents and their parenting style. This provides stronger conclusive results, which can be further expanded to other countries and cultures, according to the scope and environment changes. Gathering requirements from the parents, analysing the data collected from survey and interviews and creating a scenario-based design helped to propose a mobile application prototype that helps parents to be more efficient and knowledgeable with their children development process.

This is a constructive research, which has resulted in a successful prototype design. The prototype evaluation report indicated that the application is easy to use and provides the satisfactory user experience.

Keywords: User-centred design, parenting, mobile application, user experience, usability

1. INTRODUCTION

In the era of smartphones, applications have a great impact on the lives of users of all ages. Mobile technology has brought positive impact on people's lives along with some negative influence as well. However, with the use of mobile devices, especially with so much penetration of smartphones in everyday lives, human lives have become easier and have improved in many aspects.

With smartphones, communication has increased in terms of texting, calling, video calling, and social networks. The ways of interaction have changed. Smartphones have become solution to most problems of everyday life. Let the matter be cooking, travelling, home decorating, job finding, shopping, understanding a term or any everyday task or specific project, the first thing people do these days is searching on mobile or downloading an application to do the specific task. Same happens with the matter of parenting. Parenting is a social science field that is not only about growing a child but also learn how to live with a new environment.

This research work is an attempt to understand parenting in Finland and make an application, which can make parenting tasks easier. The paper describes the implementation of a user-centred mobile application prototype design, which focus on the features described by the parents. We apply UCD principles to design and develop an application concept. The implementation relied on mLUX mobile application framework [1]. User Experience is the key controller of this work. In the whole process, it is considered that the overall

impression of the design on the user must be positive to make the concept usable to maximum extent possible.

2. BACKGROUND

Smartphones have become necessity of everyday life. The first thing a person touch when wakes up in the morning is the phone. As was foresighted by Statista [2] the number of smartphones users for 2016 would reach 2.1 billion. This indicates that mobile usage and penetrations are in all sectors of our lives. Mobile application design and development needs special attention to draw users' attention for a continuous usage. Especially when the application deals with medical and psychological aspect, this impose additional challenges.

Steinberg [3] states that the psychologists and other experts have been studying parenting for about seventy-five years, and it is one of the most well-researched areas in the entire field of social science. Parenting is the ultimate long-term investment. Given the structure and stresses of contemporary North American society, the happiness of couples plummets the minute they become parents. And it gets worse before it gets better. However, it can be the most rewarding job of our life [4].

Parenting or child rearing is the process of promoting and supporting the physical, emotional, social, and intellectual development of a child from infancy to adulthood. According to Brooks [5] parenting refers to the aspects of raising a child aside from the biological relationship. These definitions by few most experts in the fields suggest how important parenting is from parent, child as well as social perspective. Good parenting helps foster empathy, honesty, self-reliance, self-control, kindness, cooperation, and cheerfulness. It also promotes the development of intellectual curiosity, motivation, and desire to achieve. Steinberg [3] identified that It also helps to protect children from developing anxiety, depression, eating disorders, anti-social behavior. Furthermore, good parenting helps children deter from use of drug and alcohol. When parenting is such an important factor, then designing the digital experience of parenting is a must in this era of digitization.

We are living in an unprecedented time of change, uncertainty, and rapid advances in both technology and even human behaviour. Therefore, it became indispensable to consider the concept of User Experience, apply the techniques of User-centred design and follow the principles of Usability while doing the research to design the concept of parenting application. User Experience (UX) is the experience the product creates for the people who use it in real world (Garrett 2011).

There are some mobile learning application on pregnancy such as Babycenter (<https://www.babycenter.com/mobile-apps>) which helps mothers to learn about their body changes and find the essential information. Or provides basic information and support for new-born baby as an adviser for new parents. Another famous parenting application is from the *What to Expect Foundation* (<http://www.whattoexpect.com/>).

The main features of these applications are the personalized daily tracker shows week and day of pregnancy, baby's development measured in fruit sizes, and a countdown to your due date.

Emotional support in a personalized, daily feed with fresh-curated content including pregnancy tips, reasons to smile every day, health news and passionate stories from real parents.

These applications show very good features. They have stage-by-stage description and options according to the profile with the user has entered. Even with good features and all the information needed, survey (mentioned later) suggests that parents in Finland are either not aware of the app, or even if are, not using the applications.

3. DESIGN METHODOLOGY

The term User Centered Design (UCD) was originated by Don Norman during [6]. UCD and development of interactive systems and devices have an increasing importance in product development in organizations. In this paper, we have applied the participatory design approach. The application concept development in this study is based on a UCD framework for addressing usability and user experience in mobile learning

application development[1]. Figure 1 presents the UCD framework processes for creating the parenting app.

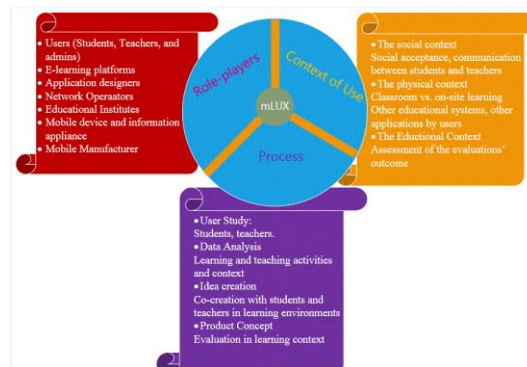


Figure 1. mLUX framework.

The framework process requires users' involvement in all stages of the application concept development. Accordingly, concept design consists of the following phases:

- User Study – In this phase the designer aims to learn the users' current ways and tools to handle their work-related tasks by applying methods such as questionnaire and semi-structured interviews.
- Data Analysis– Analyze further the collected data in the first phase. This analysis consists of an analysis of transcript coding of user interviews [7] as well as user task and environment analysis [8]. The overall requirements of the target application are identified in this phase.
- Idea Creation – By applying methods such as affinity diagrams [9], actions and requirements prepared at the previous phases are categorized. Use-case scenarios are also applied as a design method to propose the application concept to the target users.
- Product Concept – Prepared scenarios are shared with 3-5 users who provide feedback. A scenario reflects a potential application concept. The users' feedback on the scenarios are analyzed in order to validate the concept's feasibility and also to ensure that the users and designers have the same understanding about the application. If necessary, designers may return back to the previous phase to modify the scenarios.

After validating the concept, a prototype is designed based on the scenarios, followed by a usability evaluation on the prototype with target users. We conducted an initial user study based on the aforementioned framework to understand the target users, and a subsequent analysis to identify their needs. Consequently, qualitative research was conducted among parents in Finland. Resulting user profiles, scenarios and an application prototype are presented in the following sections.

4. APPLICATION CONCEPT DESIGN PROCESS

The initial user study was conducted with sixteen parents in Helsinki, Finland. These were mothers and fathers of different age child or children. Semi-structured interview was selected as a method for eliciting in-depth information about the users' requirements regarding the application. Face-to-face interviews were also conducted during two weeks during spring 2017. The interview sessions were recorded with a mobile phone for transcribing and analysis. At the beginning of interview sessions, the participants were briefed about the interview's goals. Additionally, the participants were asked to sign a consent form for recoding the session and contacting them later should further questions arise. The interviews took place as per the time convenience of parents and one session lasted approximately 30 minutes.

Table 1 shows profiles of the users. The user profile table describes how they currently use their mobile devices. There were 18 users joint to the research in which the majority were mothers and few fathers. Majority of the users were Finnish nationals. Most of the parents didn't use any application for parenting except a foreign nationality mother living in Finland. All parents depending on searching on Internet about some information or asking from maternity clinic (Neuvola in Finnish), family, or friends.

Table 1. User Profiles

Gender	Smartphone Model	Parenting Application	Whom to contact when need advice on Parenting Matters	Getting Advice from Neuvola Easy or not?	Getting Appointment from Neuvola easy or not?	Agree for interview
F	iPhone 7	Babycenter	Ask mom/friends, babycenter	Yes	Yes	yes
M	IOS 6	None	Discuss with wife	Never contacted Neuvola	Yes	Yes
F	Sony experia x compact	Internet site	Look on internet, friend, mom	No	Yes	Yes
F	Microsoft	Facebook	Neuvola, Facebook	Yes	Yes	Yes
F	iPhone	Many	Neuvola, friends	Yes	Yes	No
F	iPhone 6	None	Google, friends	Yes	No	No
F	iPhone	None	Friend, Google, neuvola	No	Yes	No
F	iPhone	None	Google, neuvola, friends	Yes	Yes	No
F	Samsung	Libero	Google	Yes	Yes	No
F	iPhone	None	Friend, web	Yes	Yes	No
M		None	Books, elder people	Yes	Yes	No
F	iPhone 6	Google	Other moms	Yes	Yes	No
F	iPhone	Google	Google, whatsapp mom/sister, friends, ask neuvola	Depends on matter, trust issues as different employee answer differently	Yes	No
F	Samsung galaxy	None	Neuvola, internet	Yes	Yes	Yes
M	Sony Xperia z3 compact	None	Consult wife	Yes	Yes	No
M	Asus zenfone	None	Parents	Don't know	Yes	Yes
F	Samsung galaxy 6	None	Google, friends, neuvola	Yes	Yes	Yes

F	Samsung galaxy s6	None	Google, reading articles, friends, closed Facebook group	Yes	Yes	Yes
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Data Analysis

In this phase, in order to understand the parents' needs, the recorded data were categorized and analyzed by applying data analysis methods such as user and task analysis and transcript coding. These methods help identify the actions and activities from interview transcripts. The actions (e.g., performing a particular task) and the activities (e.g., action that is performed at a specific time) for each user were listed and categorized accordingly. Afterwards, a merged list of actions for all users was prepared. We applied affinity diagrams and brain storming to compose a list of potential application requirements based on commonly quoted actions.

The study and analysis reflected the following main findings:

- Parents use smartphones extensively to search all kinds of child related information.
- The smartphone model varies so the app must support all possible kinds of smartphones.
- The most desired features were in relation with calling the health care services for quick guidance, and how to manage parenting and personal tasks. The app must provide filtered and precise information, due to distractions and time limitation.

Prototype Design

Based on the transcript coding and affinity diagram scenarios were created presenting following features for the app:

- Calling to 24hr Helsinki health care system for kids
- Setting reminders for appointments and tasks
- Child's health where user can see direct information and tips on health and illness
- Stage by stage information on development and growth of child
- Tips and recommendations for parents themselves for their own physical and mental health

Using only five features comes from the concept of less is more. Less features makes the system more usable and easy to use. As reflected in the interviews conducted, parents mentioned about finding all the information on internet. Selecting which guideline to use or reading or learning about everything is difficult for parents as was seen from their experience.

Concept Development

Scenarios were shared with six subjects. Four of them were the participants from the user study sample and the rest two were new users. The users were asked to go through the scenarios and provide their feedback. This provided further refining of the requirements involving the users. Further, the created idea was given a real feel by using mobile app prototyping tools. The prototype was then subjected to usability testing. Users were invited to review the prototype. Testing was carried out at the media lab in Haaga-Helia University of Applied Science. Evaluating the concept and functionality, usability report was assessed.

Prototype Implementation

Based on the features determined during idea creation, a mobile app prototype was designed. Prototyping platform provided by Proto.io (<https://proto.io/>) was used. It provides a trial account for 15 days to use the platform for free. The following figure 2 presents sample screens shoots of the designed mobile application prototype.

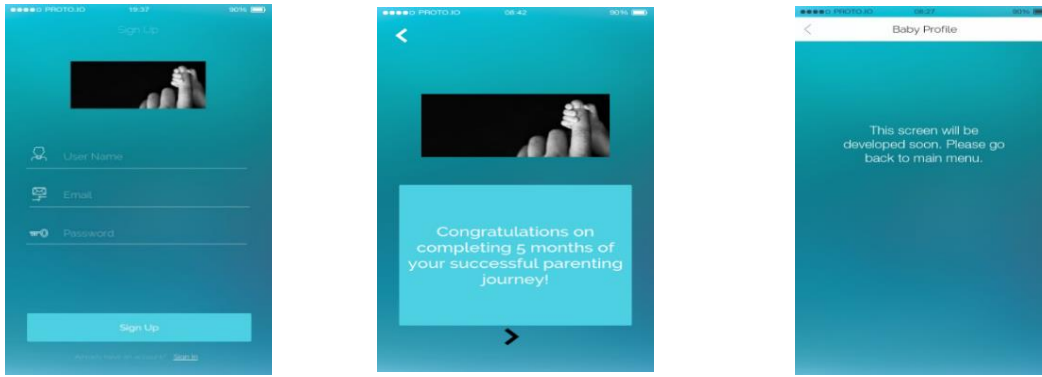


Figure 2: Home screen for the app

Every time the user (mother or father) will open the app, there will be a message for positive reinforcement. Parents need an assurance about what and how of their parenting style.

After the parent installs the app on the phone, there will be username, email and password field to register as a user to use the application (figure 2). Once the user sign-up for the first time then the app will ask to sign-in using the username and password. Once the sign-in is done, parent will be asked to provide basic information about baby, to customize the app for the parent. With information about age, gender, etc. about baby, the app will make the features specific. This way parent will get specific information quickly.

Figure 3 describes the main five features of the app determined from the data and task analysis.

- The Call feature will make a call to 24hr Child Health care system of Helsinki.
- The Reminders feature will help parent to set reminders for appointments or tasks related to baby or parenting.
- Child's Health feature will provide information about child's health tips, illness, and symptoms of specific illness, precautions and cures.
- The Milestone feature describes about the stage-by-stage development of baby as well as the next development changes in the baby.
- The For You feature will provide guidance to parents on how to relief stress, how to take care of their own health, what to do in certain scenarios like when baby is very cranky in age of 8 months, etc.

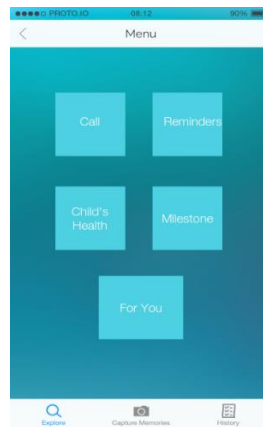


Figure 3: Application main menu

Figure 4 describes about the appointment notification. This feature reflects the automatic interpretation behind the app. According to scenario, the user books an appointment and finish the call. Within few seconds, the user receives a notification from the app that the user has booked an appointment, and if he/she would like to set a reminder. The concept comes from the user expectation. Parents want their tasks

to get easier, interpretation and smartness of technology could be used to automate their tasks or suggest the next step, without user effort.

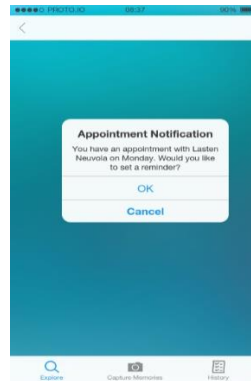


Figure 4: Appointment notification

The application provides precise information about next changes and development in the child based on the baby profile created by the user in initial stages of the app after sign-up process. The feature also describes about step-by-step growth stages. Furthermore, the application notify tells about the Child's Health feature of the app. Parents can look for symptoms of illness and cure recommendations, precautions and steps for good health and feature to input symptoms and get suggestions about what the symptoms indicate. This feature will help parents to know beforehand about health tips and illnesses, so that they can take proper action. The feature characterizes the solution where parents find changes in baby, like behaviour change, crying, rashes, but the parent is unaware about the situation. Entering the symptoms will provide all possible scenarios to the parent and suggestions for next step.

The next feature of the app is for the parents to use for recommendations on their own physical and mental health. This was the most common category from the transcript coding. Parents get stressed because of many reasons as mentioned in the interviews. This feature was introduced to provide suggestions and recommendations to help them relief their stress, do better management of their tasks and take care of their own physical and mental health.

Usability Testing

We prepared usability test plan for parenting mobile application prototype. The goals of usability testing include establishing a baseline of user performance, establishing and validating user performance measures, and identifying potential design concerns to be addressed to improve the efficiency, productivity, and end-user satisfaction [10].

Test plan

The usability test objectives were set as:

- To determine the user experience of the features.
- To determine design inconsistencies and usability problems.
- To determine the navigation errors.
- To determine the user's engagement in the app

The testing was done with 3 potential users. Parents were invited to Media Lab at Haaga-Helia, UAS, Pasila campus. The users were explained about the test scenario and testing procedure. The users were asked to sign the consent for recording the activities during testing. Quantitative evaluation metrics were pre-defined, such as scenario completion rate and time, remarks on accessibility and understanding the feature. Accordingly, tables were designed to collect data. Additionally, the plan included post-scenario questionnaire, to get feedback on overall concept, features specifically.

Test Results

Table 2 presents level of difficulties to complete tasks and overall users' performance. Metrics Score are as follows [1 – Easy, 2 – Average, 3 – Hard, 4 – Challenging].

Table 2: Level of difficulty of tasks

Task Name	Level of Task	Participants	Remarks
Calling	2	3	It was difficult for user to follow calling procedure due to design inconsistencies
Child's Health	1	3	
Reminders	2	3	
Milestone	2	3	
For You	1	3	

Table 3 presents user navigation scheme and the elapse time to perform the task for performing task. The level of involvement was engaging but it was difficult for the user to navigate due to prototype inefficiency. The user mentioned that features are easy to interpret but difficult to use as it's difficult to understand where to tap. That is why it took time to reach to right place.

Table1: Task analysis of feature navigation by user

Task Name	Level of Task	Level of involvement	Remarks by user	Time Taken to navigate to the feature
Calling	2	Engaged to reach	Task was understandable but in design where to tap was difficult but I think as you are telling this is a prototype, I don't think we will face problem with real app regarding calling.	1 min 24 secs
Reminders	1	Engaged to reach		
Child Health	2	Engaged to reach		28 secs
For You	2	Engaged to reach		22 secs
Milestone	1	Engaged to reach	I can find my queries in milestones	10 secs

The screen got hanged during the prototyping test which affected the performance adversely. The prevention and changes needed to improve the performance is discussed in Discussion and Conclusion section. The following table describes the feature use, how much the user was interested in using a feature, how much time it took to the user to reach to the place and if the user makes any particular remark about the feature.

Table 2: Task analysis of feature navigation by user

Task Name	Level of Task	Level of involvement	Remarks by user	Time Taken to navigate to the feature
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Calling	2	Engaged		5 secs
Reminders	1	Engaged to reach	Difficulty to reach to main screen	1 min 20 secs
Child Health	2	Engaged		7 secs
For You	2	Interested		8 secs
Milestone	1	Interested		5 secs

The user was quick in using the features, as the user is familiar with the concept of prototyping. The parent used all features and was quick in performing all tasks of using each feature. The time taken was reasonable.

Table 3: Task analysis of feature navigation by user

Task Name	Level of Task	Level of involvement	Remarks by user	Time Taken to navigate to the feature
Calling	2	Engaged	none	12 secs
Reminders	1	Engaged to reach	none	22 secs
Child Health	2	Engaged to reach	none	8 secs
For You	2	Engaged to reach	none	5 secs
Milestone	1	Interested	none	3 secs

Post scenario feedback provided an overall result of the app. The concept left a very good impression, but the navigation was difficult because of prototyping difficulty. The users understood the navigation features but limitation with prototype made things difficult. As per feedback, overall the result was pleasant experience with interesting features.

5. DISCUSSION

Based on the results of this paper, it is confirmed that parenting application is highly needed in Finland. The initial user study has reflected a lack of mobile application that would ease parents' work during this mysterious experience of parenthood. It is apparent from the initial study that information on parenting is plenty but still the parents do not get satisfied solution to the specific problems. Every parent is distinct, and every child has an individuality. Thus, the information available need to be categorised and personalized. The available information is abundant, unorganized and taking consuming to understand and apply. Parents have a tight schedule with a 24 hour of baby watch and care. It is also apparent that smartphones are of daily use in information searching in parenting tasks.

The evaluation results of parenting application indicate that parents were excited about the app concept and its specific features. This has shown that parents work will become easier in an organized manner and they will get the answers for different parenting matters quickly. Also, the excitement reveals that parents will become more enthusiastic with the idea of using app to make sure their parenting actions are giving the best possible results (as reflected from the post testing feedback).

The overall impression of the research and designing the concept gave positive results for the project.

The prototype evaluation report indicates that the application is easy to use and provides the essential features parents are looking for. Users were excited and gave pleasant feedbacks on the concept design. They were satisfied with the prototype as it provided them exclusive solution instead of everything to avoid the burden of what to use and when to use. The results of the usability testing exhibited a positive and enthusiastic user experience.

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