AALBORG UNIVERSITY

Master Thesis

Investigating how ICT can facilitate school-home communication and collaboration, focusing on parents' experience with Aula

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Information Studies, 10th semester

Date: 02.08.2021.

Total amount of keystrokes: 227.481

Abstract

The use of Information and Communication Technology (ICT) for school-home communication and collaboration has become more common in order to support parental involvement and engagement. In 2019 Aula was introduced as a new communication and collaboration platform in the Danish public schools. The aim was to take the Danish digital public school a step further by establishing digital solutions to support the communication, learning and well-being, as well as supporting the goals of the Danish primary and lower secondary school reform. Since the launch, Aula has been criticised for not meeting parents' needs regarding communication and collaboration with the school. In order to improve the parents' experience, we have collected qualitative data from them in order to understand their needs. With the emphasis on their experience with Aula, we have developed design solutions that reflect and support parents' needs for school-home communication and collaboration through ICT.

Keywords: School-home communication and collaboration, parental involvement, ICT for school-home usage, Aula

Glossary

Brugerportalsinitiativet (The User Portal Initiative) - a political initiative created in 2013, which help to take the digital primary and secondary school a step further by establishing up-to-date digital solutions that can support the work with communication, learning and well-being, as well as support the goals of the primary and lower secondary school reform.

Folkeskole - a type of Danish school that covers the entire period of compulsory education from the age of 6 to 16, enclosing pre-school, primary and secondary education.

ForældreIntra - a former intranet for parents of students at the school to follow the class activities. ForældreIntra was replaced by Aula in 2019.

Information and Communication Technology (ICT) - a technology that is used to handle and facilitate communications processes.

Komme/gå (Come/Go) - a module in Aula that provides the opportunity to see if children have arrived in SFO and daycare, and if they have left the institution again. In Come/Go, parents of children in daycare and SFO can report holidays and illness for their children or announce who is picking-up their children.

SFO (Skolefritidsordning) (after-school center) - a place where children can be and play around after school until they are picked-up by their parents or other family members. Children play in an after-school center under the supervision of educators.

The Folkeskole Act - the current law for the public Danish primary and lower secondary school, which outlines the guiding principles within education.

Table of Content

Stage 1: Empathise

Empathise stage

We collect data from parents in order to better understand their experiences and needs regarding Aula. We are talking to them to get an understanding about their experiences with Aula, including which features and aspects they like in Aula and what challenges they are facing when using the platform. Understanding the users behaviors and needs can help us to propose a design solution that could improve their experiences using Aula. Besides that, we are researching literature related to our field of study to better understand the research area. The data collected within this stage will serve as base for the whole project.

1. Introduction

The nature of communication has changed significantly due to the appearance of the Internet and mobile communication over the last few decades, leaving an impact on people's lives, well-being and relationships (Goodman-Deane, Mieczakowski, Johnson, Goldhaber, & Clarkson, 2016). Information and Communication Technology (ICT) plays a significant role in today's society and *"The scope of ICT is dynamic and continuously changes with the inventions of new technologies."* (Luić & Glumac, 2009, p. 311). The change of communication may have many potential benefits such as enabling people to stay in touch more easily and quickly, however, it also has side effects (Goodman-Deane et al., 2016).

In 2013 a new initiative regarding digitalization of the Danish Municipal schools was developed. The political initiative called Brugerportalsinitiativet (The User Portal Initiative) aimed to take the Danish digital public school a step further by establishing digital solutions in order to support the communication, learning and well-being, as well as supporting the goals of the Danish primary and lower secondary school reform (KL, n.d.-a). BPI includes procurement of a learning platform which is chosen by the municipalities, as well as acquisition of the common municipal communication platform Aula (KL, n.d.-a). Aula is a digital tool that aims to make it easy and safe for pedagogues and teachers to communicate and coordinate internally, with the childrens' parents and with the children (Jammerbugt Kommune, n.d.).

Aula was introduced and implemented in the first Danish public school in the fall of 2019. During the years of 2019, 2020 and 2021, Aula was implemented in all Danish public schools, and throughout the year of 2020 Aula was implemented in daycare services along 97 municipalities. Fully implemented, Aula will count approximately 2 million users. The users of Aula include children (students), parents, teachers, pedagogues and other municipal employees related to school and daycare services (Implementering af Aula, n.d.).

Both before and after the launch, Aula has been under criticism (Dandanell, 2019; Thorsøe, Hagelskjær & Lichscheidt, 2019; Appendix 2 - A&B Analysis). Aula has been criticised for providing parents with overwhelming and redundant information, for being difficult to navigate in and for not being clear and intuitive regarding how to report children's absence (Riise, 2020; Appendix 2 - A&B Analysis). The app version of Aula has been criticized for being unstable regarding login and certain types of information, and therefore parents had to use other devices in order to see the information (Thorsøe et al., 2019).

A survey from February 2020, conducted by A&B Analyse (Appendix 2), compares Aula to it's Aulas predecessor Forældreintra. The survey shows that 22,8% (N=393) of the participants think that Aula is better than Forældreintra, 48,4% (N=393) think that Aula is neither better nor worse than Forældreintra and 28,8% (N=393) find Aula worse than Forældreintra. The distribution of the answers can be seen in Figure 1 below.

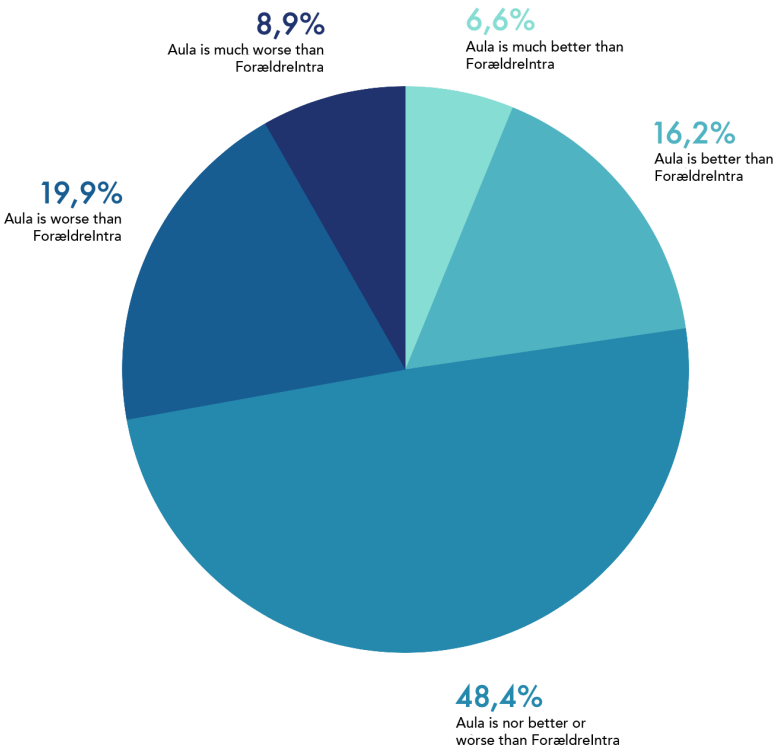

Figure 1: Satisfaction with Aula.

Motivated by the ongoing criticism and dissatisfaction with Aula, this thesis explores how Aula can be improved in order to better support the school-home communication and collaboration. With the emphasis on parents' experience with Aula, we aim to develop design solution that reflect and support parents' needs for school-home communication and collaboration through ICT. As user experience (UX) design is about designing systems that aim to meet the exact needs of the user, we aim to meet the users in the context of use, considering all aspects of the users experience, including enjoyment, pleasure and efficiency (Interaction Design Foundation, n.d.; Norman & Nielsen, n.d.). As the inventor of the term *user experience,* Don Norman states: *"No product is an island. A product is more than a product. It is a cohesive, integrated set of experiences. Think through all of the stages of a product or service - from initial intentions through final reflections, from first usage to help, service, and maintainance. Make them all work together seamlessly."* (Interaction Design Foundation, n.d.).

On this basis, we have developed the following problem statement.

1.1. Problem statement

PS: How can Aula be improved in order to better facilitate school-home communication and collaboration, focusing on parents as users?

In order to answer the problem statement we are, throughout the research process, eliciting information from parents about their experiences and needs in relation to school-home communication and collaboration. By getting an understanding of the users' experiences, we can elicit the users' needs to examine how they relate to the actual use of the system (Dix, Finlay, Abowd & Beale, 2004a). By using this information, we aim to translate the users' needs into system requirements. We find it crucial to explore what factors make information and communication technology (ICT) successful, what needs parents have regarding school-home communication and collaboration, as well as exploring what challenges they currently experience with Aula. In order to

answer the problem statement, we have therefore developed the following research questions, which are examined throughout the research:

1.2. Research questions

RQ1: How can ICT be designed in order to support and facilitate school-home communication and collaboration?

In order to support our redesign of Aula, we use the existing knowledge and related work on how ICT can be used to design and support the school-home communication and collaboration.

RQ2: What factors are crucial to parents' involvement and engagement in their children's schooling?

As Aula is a communication and collaboration platform created in order to support parent involvement and engagement, we find it important to uncover how parents involve and engage themselves in their children's schooling. Aula should be designed in a way that reflects and matches the parents' needs regarding involvement and engagement.

RQ3: How do parents currently experience Aula?

In order to find the problems that cause user dissatisfaction with Aula, we aim to get an understanding of the parents' experiences with Aula. Based on the wishes and experiences of the users, Aula is continuously improved and updated (Aula, n.d.-a). We therefore explore parents' current experience with Aula.

RQ4: What needs do parents have regarding school-home communication and collaboration through ICT?

As we are working with a user-centered approach, user needs will be the focal points of our design solution. It is therefore important for us to get a thorough understanding of parents' needs, which we aim to elicit by analysing their overall experiences of Aula.

RQ5: How can the parents' needs be met in order to improve Aula and thus the school-home communication and collaboration?

In order to create a successful redesign that both fits the users needs, supports and facilitates school-home collaboration and communication, we aim to get an understanding of how parents' needs for communication and collaboration can be reflected and supported by Aula.

1.3. Limitations & Research scope

Despite our efforts to minimise constraints for our thesis, there are some limitations that cannot be avoided, and that need to be addressed in the beginning of the thesis.

First of all, this thesis is focused on a small sample of the population, and it provides less precise estimates in comparison to a larger sample (Bryman, 2012a). As the population is comparatively small in comparison to the total number of Aula users, an overall meaning and experiences with Aula will not be presented within this research.

Furthermore, this research is focusing only on Aulas app, and not on the desktop version of Aula. The main reason behind that is the fact that almost all of the interview participants we have gathered data from only use the Aula app on a daily basis, and not the website version of it. It might have some differences as usually websites and apps

differ from each other regarding available functions and their usability, for example push notifications that users can receive using an app (Bushnell, 2020).

Even though the system has several different users including teachers, educators, children and childrens' parents, this project is only focusing on parents and their perspectives, and therefore will exclude the rest of the users of Aula.

Another important aspect to mention is that private schools in Denmark are not required to use Aula, but can choose other digital solutions, as well as continue to use ForældreIntra if they wish (Implementering af Aula, 2018), and therefore we are not including them in our research.

Very important limitation of this project is caused due to confidentiality as some elements of the system will not be allowed to show and use in the thesis or to publish the thesis due to rules about GDPR.

The Covid-19 situation may cause several issues and challenges regarding potential users for usability testing, as well as meeting interviewees in person. Therefore sessions have been conducted online, which could cause several issues regarding Internet connection, bad signal, technical issues and so on.

1.4. Research approach

To achieve a clear understanding of the users' needs as well as a clear understanding of the reasons why the system should be redesigned is an approach that Whitten and Bentley (2007) describe as *user-centered development*. User involvement is described as one of the most critical factors in order to succeed (Whitten & Bentley, 2007), which is why we have chosen to involve the users of Aula in the early stages of the development process.

A user-centered approach in relation to interaction design concerned with the users and their needs, when the purpose is to develop interactive products that are beneficial, easy to learn, enjoyable and effective for the user to use (Rogers, Sharp & Preece, 2019a). In order to create a design solution that is based on the users needs, we first need to explore and understand the purpose of using Aula, parents' experience when interacting with Aula, how Aula facilitates these needs already and what challenges parents might have when using Aula. This knowledge helps us to understand what improvements are necessary in order to better support the parents' needs regarding ICT.

Pragmatism is defined as a paradigm that is "(...) *concerned with action and change and the interplay between knowledge and action."* (Goldkuhl, 2012). Knowledge is not seen as a representation of reality, but instead *"Pragmatism rather emphasizes the primacy of practice and the use-value of the ideas and theories produced by the researchers''* (Kvale & Brinkmann, 2015a, p. 60). A pragmatic approach encourages the researchers to focus on the practical aspects, the craftsmanship and the use-value of their work and research results (Kvale & Brinkmann, 2015a).

Throughout the research and design process we focus on the parents' experience with Aula in the sense of Aula's context of use. In other words, in order to be able to improve Aula, we need to understand in which context parents use Aula.

1.5. Outline & Framework

This section provides a description of the framework used for this thesis as well as an outline describing the structure of the report.

1.5.1. Design thinking

Design thinking is a design methodology that can be used as a creative problem-solving and solution-based approach helping to determine and creatively solve problems by understanding the human needs involved, as well as re-framing the problem in a human-centric way. Besides that, ideas are created in brainstorming sessions and later

prototypes are created and tested (Dorst, 2011). The term simply implies that one is approaching problems and their solutions as a designer would. It is most useful to apply design thinking in situations when the problem, or opportunity is not well defined, and an idea or a concept of a solution is needed. It can be used in various ways within a business including new venture creation, business model design, as well as process improvement. Over the years design thinking has become more often used within new product development as design thinking often leads to better solutions that address the most important user needs. One of the main reasons for that is that design thinking helps to avoid investing too many resources too early in a project to develop a single and specific solution (Luchs, Swan & Griffin, 2015).

Design thinking consists of five stages: *Empathise, Define, Ideate, Prototype*, and *Test* (See Figure 2). As the stages within design thinking are not necessarily following a linear path, they help to develop new ideas or showcase new findings within the user journey. Different stages within design thinking could help researchers to constantly examine new and untested angles of the project (Luchs et al., 2015).

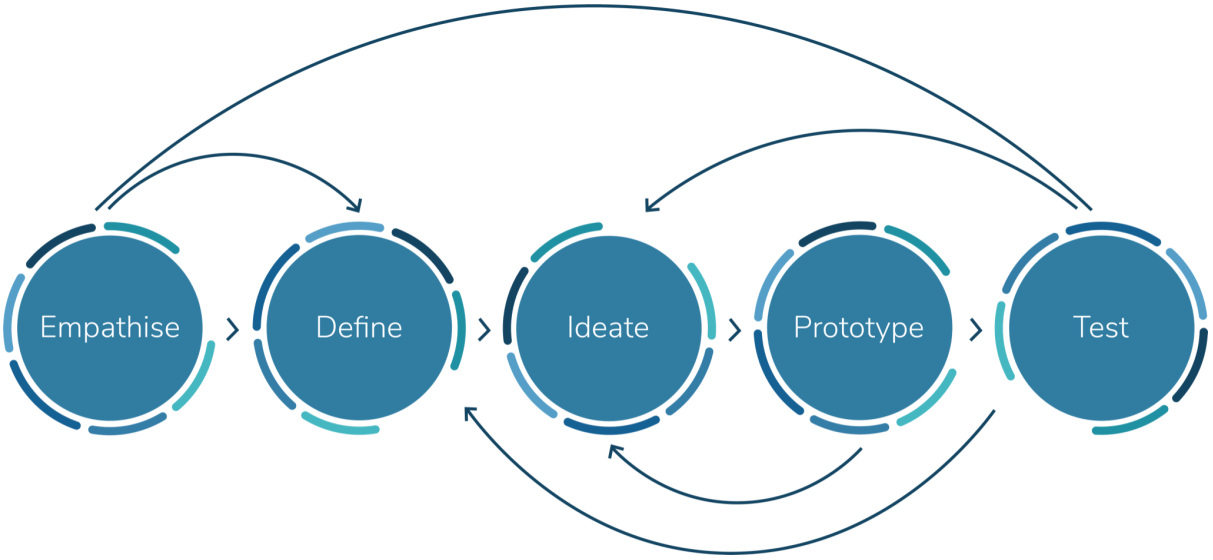

Figure 2: A framework of Design Thinking consisting of 5 stages: *empathise, define, ideate, prototype,* and *test.*

1.5.2. Outline

We have chosen to use design thinking as a framework for our thesis, as design thinking is an agile, iterative process, and that the processes within it can be done several times if needed. In comparison to many other frameworks that are broken down into steps, design thinking allows us to bounce between processes as needed, until the right design and solution is found (Luchs et al., 2015), giving us an opportunity to go back and forth between the different stages of the process. The thesis is built upon the five stages: *Empathise, Define, Ideate, Prototype, and Test* (See Figure 3). In the following section each of the stages are described, as well as a short description of the content of each chapter is provided.

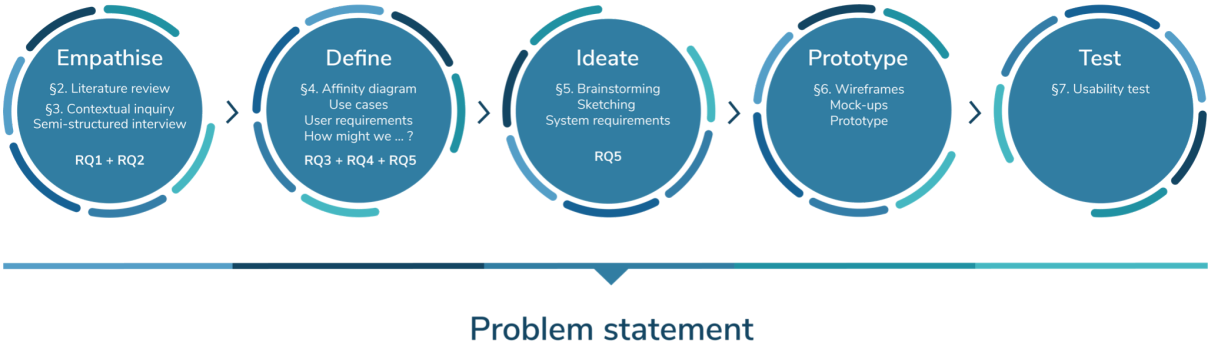

Figure 3: Outline of the thesis.

1.5.3. Stages of design thinking

Further each stage within design thinking is explained more in detail.

Stage 1: Empathise

The problem of understanding the user and his or her experience is crucial within user-centred design (Koskinen & Batterbee, 2003). Within the first stage of design thinking, accordingly the *empathise stage,* the team observes and talks to real people in order to absorb their opinions, building a bridge between a user and a product (Dorst, 2011) as well as getting closer to their experiences and lives aiming to "step into the user's shoes" with the purpose of designing products that fit the users' lives and needs (Kouprie & Visser, 2009). This stage is crucial for the whole project as within the empathise stage motivations and experiences of the users are gathered, and without them problems cannot be solved (Luchs et al., 2015).

The empathise stage is focusing on gaining empathy with users, by developing an understanding of their experiences, context and behaviors. While still working on the data collection process, researchers need to start synthesizing the gathered data. However, the empathising work is not completed as the empathise stage is built on iteration between data collection and data synthesis. Qualitative data (i.e., audio

recordings, transcripts, etc.) should be translated into specific customer insights, that can be done in several ways, including coding transcripts, creating customer journey maps or creating personas. It is important to continually iterate between data collection and data synthesis, and not wait to synthese data until all necessary data is collected. Iteration requires flexibility and patience from researchers, but it ensures them that the most suitable methods are used (Luchs et al., 2015).

Within the empathise stage we are collecting data from parents in order to better understand their experiences and needs regarding Aula. We are talking to them to get an understanding about their experiences with Aula, including which features and aspects they like in Aula and what challenges they are facing when using the platform. Understanding the users behaviors and needs can help us to propose a design solution that could improve their experiences using Aula. Besides that, we are researching literature related to our field of study to better understand the research area. The data collected within this stage will serve as base for the whole project.

Introduction (Chapter 1) describes the problem area, significance and motivation for the research, and defining problem statements and research questions, which are answered throughout the thesis. *Literature review* (Chapter 2) defines the execution of traditional literature review, as well as presenting scientific papers of relevant literature that contribute to our field of study and guides the formulation of the problem statement and research questions. *Data collection* (Chapter 3) presents the population, the data collection methods, along with validity, reliability and ethical considerations in regard to the methods.

Stage 2: Define

Define stage helps to identify a problem or a challenge, which needs to be solved with a design solution that is created later in the process. Within the define stage the researched understanding should be translated into the human-centric issue at hand. The team analyses the observations and insights gathered throughout the empathise

stage, and synthese the information afterwards (Kolko, 2011). The main purpose within the define stage is to identify and form connections putting emphasis on finding relationships and patterns between different elements, as well as forcing an external view of things. Within this stage it is not important to be accurate, but rather come up with abstract ideas, thoughts, and reflections (Kolko, 2010).

At this time of the process, the team should have synthesized information about users and their contexts that should be used to define user needs and insights. These needs and insights should then be framed as discrete "problem statements", which should be used as a basis for idea generation within the next stage of design thinking - the *ideate* stage (Luchs et al., 2015). We have used *How might we …?* technique in order to frame the problem and create a basis for the idea generation.

Analysis & Results (Chapter 4) presents how the collected data is analysed, and what we have found out. Within this chapter we explain all the different processes and methods used in order to analyse and categorise the data into themes in order to define problems within Aula. In the end of this stage, we present HMW questions that helped us to frame the insights into opportunities in order to find a design solution for this research.

Stage 3: Ideate

Ideate stage is heavily focusing on the ability to invent as creative solutions should be invented in order to solve the defined problem. Thinking outside the box is very important within this stage to come up with the best possible solution, instead of focusing on limitations in terms of scalability or budget (Luchs et al., 2015). By combining insights that have been gathered with design patterns that have been identified earlier in the process, the team has to examine and consider all the insights. Thereafter the team methodically considers each facet of the design problem that seems to be important or useful. This process is divergent as the team thereby produces new ideas (Kolko, 2010). The concept or set of concepts created within this stage then can be

shared with the target audience in order to gather feedback from them, and that can through iterations be improved upon (Dorst, 2011).

There is a wide variety of techniques and tools to generate ideas. After ideas have been generated, the work team should group and refine them, and then select the most promising ideas. However, it is important to note that the design team should not filter ideas too much as ideas can still be improved upon during the next stage - prototyping. After the team members have agreed upon the final idea for the solution, they should move further to the prototype stage (Luchs et al., 2015).

In *Design* (Chapter 5) we describe the design process and present our design ideas. In order to do that we have used sketching as a technique to visualise the design ideas to find out which of the ideas would solve the problems in the best possible way. The user requirements functioned as a checklist during the ideation stage, as we continuously were aware of the user requirements to ensure that the design idea fulfilled them. After the final ideas are selected, system requirements have been defined in order to describe what features Aula should contain in order to fulfill the users needs.

Stage 4: Prototype

To represent a design idea, a prototype can be used, which is typically created before final artifacts exist, and it helps to explore and communicate evolving ideas and potential solutions. Prototype is an essence of how designers do their work, and it involves moving from abstract ideas, analysis, theories and plans to concrete, tangible and experiential things (Coughlan, Suri & Canales, 2007). It is mainly used to make the product "come to life", and it helps the team to learn, discover, generate and refine designs. Besides that, it is used as a tool to evaluate design solutions, finding out whether it has been a success or a failure by testing the design solution with real users (Lim, Stolterman & Tenenberg, 2008).

Prototypes can be made at any level of resolution - from very rough to highly refined - and they can be used at any stage within the design process in order to explore, evolve and communicate ideas (Coughlan, Suri & Canales, 2007). Prototyping usually involves the creation of small-scale, inexpensive versions of the product that could be made using sketches, models or digital renders of the idea. It usually contains specific features that help to test problem-solution scenarios in order to find out what works and what does not work within the product. In the perfect scenario, prototyping can cover additional user experience problems that would help the researchers to understand the user behaviours, reactions and expectations (Luchs et al., 2015).

Prototype (Chapter 6) provides a presentation of our prototype and description of its development process. Wireframes and mock-ups were created in order to present how the design solution would look like, and used in order to build our prototype. The prototype is used within the last stage of the process in order to determine if we have understood parents' needs correctly. When a prototype has been created, it should be tested and evaluated (Luchs et al., 2015). The evaluation of a prototype takes place within the next stage of the design thinking process - *the test stage*.

Stage 5: Test

The *test* stage requires real users within the target audience in order to generate real data by receiving their feedback. It is possible that the test will be done not only once as testing is an iterative process, and researchers are allowed to roll out multiple prototypes and test them until the most suitable solution is found. They should expect to go through a series of edits, changes, and refinements in order to do that (Luchs et al., 2015).

The *test stage* typically consists of two types of activities: *sharing prototypes with potential or existing users to gain feedback* and *synthesizing the feedback received*. To gather the most valuable feedback from users, the prototype should be used to simulate an experience for the user that makes their interaction with the product more real. After

the feedback has been received, researchers should proceed with a process of synthesizing it, similarly to the empathise stage to gain further insight in addition to converging on the most suitable solution or elements within it. Depending on the synthesis of the feedback gathered, the researchers then decide where to go next in regards to the design thinking framework. Some go back to other design thinking stages such as ideation or prototyping if they find additional potential solutions or parts of it in order to improve the current version of the product. The best possible scenario is that the researchers move further to development of the product (Luchs et al., 2015).

Evaluation (Chapter 7) presents the evaluation of our design solution including the process and test results. Within the test stage our design solution is tested on both Aula users and potential Aula users. By conducting the test sessions we aim to see if we have understood the users needs correctly and if our design solution are qualified.

Further in *Discussion & Conclusion* (Chapter 8) is presented consisting of a discussion of our literature review, research and analysis methods, research results and design solution. Within this chapter the problem statement of our thesis is answered.

1.6. Background

This section aims to provide the reader with a deeper understanding of Aula and the context of use, including Aula's mission and vision, as well as an introduction to the modules of Aula.

The Folkeskole Act provides an overall framework for the schooling activities (Ministry of Children and Education, 2018). According to The Folkeskole Act §1, the purpose of the Folkeskole is to collaborate with parents in order to give students skills and knowledge that will prepare them for further education, as well as encourage them to want to learn more (The Folkeskole Act, 2020). The schools' demands for parental involvement in learning and well-being therefore increasingly

require resources, which give different parents different opportunities and limitations in order to help their children do well in school (Akselvoll, 2016). Parent and collaborative cultures are different, and Aula must reflect these differences in order to succeed (Riise, 2020). On the basis of experiences and wishes from the users, Aula is continuously being improved and updated. Aula's steering group has in this connection designed a development plan, in order to help prioritise which of the modules in Aula that are the most important to improve and update. According to Aula's prioritization model (Aula, n.d.-b), the modules of highest prioritisation are Messages, Overview, Calendar, Gallery, Come/Go, Secure File Sharing and Widgets.

Stakeholders and purpose of development

Aulas' stakeholders include the IT company Netcompany, who is responsible for the development of Aula, the communication and design company Advice A/S which, in collaboration with Aulas' users, is responsible for the design of Aula. Kombit was responsible for the purchase of Aula, and KL is a part of the agreement made in 2014, which concerns a digital boost of the folkeskole. The agreement was made between KL and the government. All public schools should be provided with a communication and collaboration tool in order to support work at any school (Aula, n.d.-c). "*Aula is about supporting the collaboration on children's learning and well-being by creating space for good communication between professionals, children and their parents."* (Aula, n.d.-c).

Target groups

Aula's target groups concern all parties that are affiliated with the Folkeskole Act, the Secondary School Act and the Day Care Act. However, the main target groups are custodians, persons with adult responsibility for vulnerable children and young people (Aula, n.d.-d).

Delimitations

Aula is not a learning platform, a subject system or an administrative system. Aula is furthermore delimited from children in the age 0-6 years old, as they are not direct users of Aula, and therefore not considered as an independent target group (Aula, n.d.-d).

Aula's mission and values

Aula's mission is to support the learning, development and well-being of children.

As a communication platform, Aula creates value by supporting and facilitating the collaboration between school and home, as well as among the pedagogical staff. Aulas' users are provided with a coherent user experience, by giving access to the municipalities IT solutions at school and daycare area. Aula is designed as an open platform, which, besides representing and sharing data with market IT solutions, also gives access to learning platforms, from which digital teaching aids can be accessed (Aula, n.d.-d).

Sitemap

In order to provide an overview of Aulas modules and functions, we have created a sitemap (See Figure 4; Appendix 3 - Sitemap). The modules that this thesis concerns are Messages, Come/Go and Calendar.

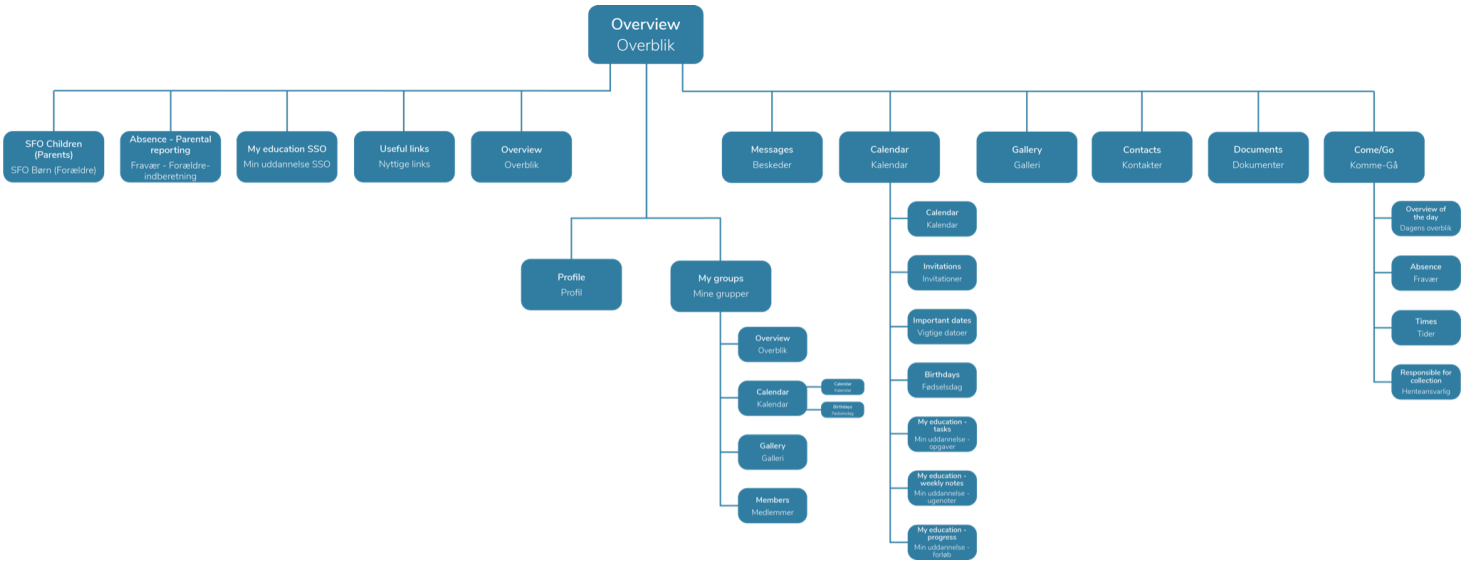

Figure 4: Sitemap of Aula.

2. Literature review

The purpose of this chapter is to provide a fundamental understanding of the subject area regarding this thesis. In order to better understand the concepts that are related to the problem area of this thesis, as well as establish a common ground for both the authors and the reader, a thorough review of relevant literature was conducted. The subject areas concern school-home communication and collaboration, parental involvement, and information and communication technology (ICT).

The section about school-home communication and collaboration provides the researchers and the readers with an existing knowledge about the factors that are important in order to achieve successful communication and collaboration between school and home. The section about parental involvement provides an understanding of how parents involve themselves in their children's schooling, what factors are crucial regarding parental involvement and which effects parental involvement has on the children's schooling. The section also provides knowledge about how parents can be influenced and motivated in order to increase their involvement and engagement. The section about ICT provides an understanding of how ICT can facilitate the communication and collaboration between school and home, and what type of technology effectively can support it. The section also provides knowledge about how ICT can be designed in order to both facilitate the school-home communication and collaboration, as well as how it can facilitate and support parents' needs regarding communication and collaboration with the school.

The following chapter provides a description of our literature search and literature reviewing process, followed by a presentation of our literature review, which is focusing on the three aforementioned main subjects of this thesis.

2.1. Traditional literature review

A literature review is a comprehensive and objective summary, and critical analysis of the relevant literature on the topic that is being researched. There are several various reasons for carrying out a literature review as it supports the research topic, the problem statement and the research questions or hypotheses, and builds an understanding of theoretical concepts and terminology. Moreover, it also provides an overview of the current literature about the subject area (Hart, 1998).

Traditional literature review (also called narrative literature review) critiques and summarises a body of literature and draws conclusions about the topic of the research. This type of literature review is useful when a high volume of relevant literature is gathered, and it needs to be summarised and synthesised. Literature review can also inspire research ideas by identifying gaps or inconsistencies within the knowledge, thus helping researchers to define research questions or hypotheses (Coughlan, Cronin, & Ryan, 2007).

We have chosen to make a traditional literature review as it helps to provide the reader with a comprehensive background for understanding current knowledge, as well as highlighting the significance of new research. The literature review also helped us to gain more knowledge about our research area, and to identify information or methods that might be relevant for our research. It also helps to put our own work in perspective to find out if we are doing something completely new, or researching something that has already been researched, just looking at it from a different angle (Coughlan, Cronin, & Ryan, 2007).

2.1.1. Literature search

One of the first steps in the literature search was to find useful keywords for query searches. These keywords were found by using a building block strategy. Building block

strategy consists of facets that each respectively contain a set of keywords (Cronin, Ryan, & Coughlan, 2008).

Several different keywords within the areas of interest were searched for, and they were subsequently combined as search terms by using the Boolean operators “OR” and “AND” (Schlosser, Wendt, Bhavani, & Chiwetalu, 2006). Keywords that represent each of these blocks and their corresponding sub-blocks were found. These keywords include numerous synonyms and similar terms in order to maximise the chances of finding potentially relevant literature.

We have eliminated our research to ProQuest, EbscoHost, Web of Science, Primo, ERIC and Google Scholar as we have been introduced to these databases throughout our study program. The combination of these databases made the field of searching broad, covering all the research topics. In order to ensure the quality of our literature, we have only included peer-reviewed literature in our review. Peer-reviewed literature is literature that has been reviewed by other professionals, ensuring that it is accurate, significant and relevant (Govender, 2015).

2.1.2. Literature reviewing

After further inspection of the literature, it was either added to the literature list or discarded. In the beginning of the literature search, the search queries were not specific enough, which meant that the search results were measured in thousands and millions. We refined the search queries which also narrowed down the number of search results. We searched the databases individually and created a search log (See Appendix 4 - Search log) with our search results, which were examined later on.

After reviewing the literature, we found almost 40 relevant articles that needed to be reviewed more in depth, in order to gain a deeper understanding of the areas of interest for our thesis.

We have used the following questions (Cronin et al., 2008) to extract necessary information for the literature review:

- *Title, author, year, journal (publication metadata):*
- *What is the type of literature?*
- *What is the purpose of the work?*
- *What methods were used?*
- *What are the major findings, important concepts/themes?*
- *How is it relevant to our project?*

In the following sections we present the findings of our literature review, concerning the three aforementioned main topics: school-home communication and collaboration, parental involvement, and Information and Communication Technology (ICT).

2.2. Difference between school-home collaboration and parental involvement

During our literature search, we found that school-home collaboration and parental involvement are two terms that often are confused with one another. We therefore find it important to distinguish between the two of the subjects.

While school-home collaboration is in some ways related to parental involvement, the term itself is broader and more inclusive. The main distinction between school-home collaboration and parental involvement is the nature of the relationship. Whereas parental involvement is seen as a one-way flow of information between school and parents, school-home collaboration involves a two-way information exchange (Christenson, 1995). Parent involvement focuses on parents becoming involved in their children's education, whereas school-home collaboration focuses on the joint involvement of parents and school personnel in children's education. The activities may

seem similar, but the philosophy of working toward a common goal with shared power distinguishes school-home collaboration from parent involvement (Christenson, Rounds, & Franklin, 1992). As the two terms often are seen as distinct and discussed separately by other researchers, we will do so in our thesis.

2.3. School-home communication and collaboration

Communication is a significant part of the daily lives of families, educational employees, and students across all grade levels, and it serves many purposes within personal and professional relationships (Natale & Lubniewski, 2018). According to Nwogbaga, Nwankwo, and Onwa (2015), *"communication refers to the process of exchanging information between or among individuals, groups, institutions, and/or organizations in oral, written, or signed forms through any available media"* (p. 33). Through effective communication, including both verbal and non-verbal communication methods, people can collaborate to meet a common goal or complete a project efficiently (Sharma & Sharma, 2014).

In order to maintain proper communication between school and home, it is essential to have the student's best interests behind each line of communication. Even if each stakeholder may have the same goal, defining clear roles can help to facilitate the process of communication (Dagenais et al., 2015) as it provides each stakeholder with a coherent understanding of expectations for further communication (Natale & Lubniewski, 2018). School-home communication is important in order to create an understanding of school programs and children's progress (Ramirez, 2001). In order to evaluate the effectiveness of communication among educators, students, families, and other educational workforce, the communication should be analyzed and reviewed periodically (Natale & Lubniewski, 2018).

Within the educational setting, effective communication strategies and collaboration between school and home has an overall positive effect on a student's academic

standing and achievement. It also serves as an integral contribution to the academic, social, as well as emotional success of students (Natale & Lubniewski, 2018; Can, 2016).

Although school-home communication is a significant factor in children's schooling, time factors often affect interaction between parents and teachers. Parents typically do not have time to communicate with the school while they are at work, and teachers, however, are inaccessible after parents are back at home from work. That is just one factor besides other factors such as additional home and professional responsibilities that parents are responsible for, that interfere with both desired quality and quantity of parent-teacher interaction (Natale & Lubniewski, 2018).

2.3.1. Traditional methods of parent-teacher communication

In pre-internet times, the forms of communication that were typically incorporated in schools included parent-teacher conferences, handwritten notes between parents and teachers, memos sent home by the teacher or the school, report cards, and parents' signatures on homework, books, and tests. Some parents found certain techniques of communication challenging as, for example, they were often not comfortable with notes either to or from school. Sometimes it was supplemented with a child who lost or forgot messages that were sent between school and home (Cameron & Lee, 1997).

According to Test, Cooke, Weiss, Heward, and Heron (2010), traditional methods of parent-teacher communication, which might be required and effective for certain purposes, realistically cannot provide the basis for systematic and continuous parent-teacher communication. These traditional methods include bulletin boards, notes sent home, or in-person meetings that are all becoming less effective as technology continues to improve (Natale & Lubniewski, 2018).

2.3.2. Communication through technology

A study conducted in order to understand technological communication patterns and perceptions at the elementary level, with 28 families from a New Jersey elementary

school, showed that participants varied in terms of technology use and that school teachers and educators are moving towards a more technology based form of communication, such as email, *GoogleClassroom*[1], or other apps, rather than traditional methods such as a note sent home (Currie-Rubin & Smith, 2014; Kosaretskii & Chernyshova, 2013). Another study from Yumurtachi (2017) shows that email has proved to be the prefered method of communication between school and home.

A study about the perception that families have towards technological communication with the school, shows that slightly over half of the participants view communication as interactive as opposed to one-sided from the teacher or as non-existent. Based on the data collected, teachers should make an effort to be interactive when communicating with families rather than posting information without allowing some form of response or discussion. Utilizing online platforms or mobile applications for communication purposes, professional relationships may develop, increase parent involvement, and reinforce information shared among the school community. By providing families with a platform to work together may facilitate positive relationships and become more self-reliant as a group (Can, 2016). Most families also stated that reciprocity when communicating through technology is necessary, and that they would rather receive an abundance of information rather than not enough information. This form of advice should be encouraged and welcomed by schools and education institutions (Tatar, 2009).

Families typically communicate with the school using technology to gain information regarding their children (Kosaretskii & Chernyshova, 2013), but within a perfect scenario, teachers and families should be communicating through mutual communication rather than one-sided communication (Natale & Lubniewski, 2018). Two-way communication between school and home has become more relevant in comparison to one-way communication, and, according to research made by Berklan and Hughes (2020), two-way communication is of high priority over one-way communication.

[1] Google Classroom is a free web service developed by Google for schools that aims to simplify creating, distributing, and grading assignments. https://classroom.google.com

2.3.2.1. Advantages and disadvantages of communication technology

Even though there are several different mediums for communication between families and educational employees, they often choose technology in order to communicate. Each individual who takes a part in the communication should understand advantages and disadvantages, and generally usage of the tool being used (Natale & Lubniewski, 2018).

Teachers and families are relying more on using technology to communicate effectively as technology has the ability to build connectedness between school and home since communication can be instant (Natale & Lubniewski, 2018). Schools can quickly reach many parents by integrated technology within communication strategies (Ramirez, 2001), as stakeholders can now have the ability to quickly respond via email, text messages, online portals or discussion boards, and the ability of quick responses creates an expectation of efficiency. Teachers often include mass-messages within their communication that are spread to the whole class, unless teachers want to directly communicate with one particular student or particular students' parents (Natale & Lubniewski, 2018).

Natale and Lubniewski (2018) states that some teachers and parents communicate with each other using phone calls, sometimes even text messages, as well as emails, depending on the teacher or family's preference. However, even telephones have multiple advantages, it appears not to be the primary communication tool between school and home. Infrequent usage of telephone often makes parents feel that a telephone message from school signals bad news (Natale & Lubniewski, 2018).
Research shows that parents also are interested in better and more frequent communication with the school staff, and that they want to help their children succeed at school (Henderson & Mapp, 2002). In a study by Bauch and Phillips (1991) parents expressed an increased involvement in their children's education and reported an improvement in the children's grades and skills when an electronic telecommunications technology provided them with a daily voice message from school. Voice-mail messages can be used to keep parents informed about classroom activities, upcoming events,

homework assignments, and general news about school. It can be a powerful tool for the exchange of information between teachers and parents who wish to communicate on a regular basis (Cary, 2006; Henderson & Mapp, 2002). Kraft and Rogers (2015) found that individualized messages in a single sentence sent out to each student and their families every week *"reduced the percentage of students who failed to earn course credit by 41 percent"* (Kraft & Rogers, 2015, p. 3). The messages included one specific thing that the student either could improve or one thing that the student did well on (Kraft & Rogers, 2015). Targeted outreach to parents is known to make a difference in relation to the students and their results, but Kraft (2017) discovered that the teacher-parent communication in many schools "*is infrequent, unsystematic and not adequately supported"* (Kraft, 2017, p. 4).

Communication using technologies has clear advantages; however, the non-verbal aspect can be lost virtually, which can affect the tone of the message being sent, and messages perceived as negative (Natale & Lubniewski, 2018). For example, when teachers communicate with families through technology, there may be a misperception of the tone of the message as communication is often quick and direct (Kosaretskii & Chernyshova, 2013). Therefore it is important to find an appropriate method, or channel for school-home communication when reaching out or responding to families (Natale & Lubniewski, 2018).

2.3.3. Summary

School-home communication is important in order to understand school programs and childrens' progress (Ramirez, 2001). Effective communication and collaboration between school and home has an overall positive impact on student's academic standing and achievement, as well as their social and emotional success (Natale & Lubniewski, 2018; Can, 2016).

Tatar (2009) states that most families rather receive an abundance of information rather than not enough, and that they think that reciprocity is important when communicating through technology. Natale and Lubniewski (2018) report that families perceive technological communications with school as interactive, and that they are interested in interacting with teachers and participating in discussions rather than receiving one-sided information from them. Online platforms and mobile applications used for communication purposes help to develop professional relationships between school and home, increase parental involvement and reinforce information shared among the school community (Natale & Lubniewski, 2018). Can (2016) states that by providing families with a platform to work together, positive relationships can be obtained, and that families can become more self-reliant as a group. Moreover, a research by Berklan and Hughes (2020) states that two-way communication is of high priority over one-way communication.

2.4. Parental involvement

Parental involvement can include and be defined by involvement in childrens' homework, their social life in school and general school activities, as well as volunteering or participating in school activities, or being a member of parent-teacher organizations (Hayes, 2011; Wiseman, 2010). The nature of parental involvement in education has changed over time both in terms of the aspects of schooling where parents are expected to be involved in, as well as the intensity of this involvement at home (Reay, 2005; Selwyn, Banaji, Hadjithoma-Garstka, & Clark, 2011). However, many principals and teachers describe that lack of parent involvement continues to be an issue in order to increase student achievements at school (Olmstead, 2013).

Driessen, Smit, and Sleegers (2005) divide parental involvement into two types: *school initiated involvement* and *parent initiated involvement.* Furthermore, parental involvement can be either reactive or proactive. Reactive parental involvement includes activities such as meetings at school, family activities, or volunteering, while proactive

parental involvement are activities such as helping with homework, staying informed about school events, and following the children's progress (Olmstead, 2013).

2.4.1. Frequent communication and increased parental involvement

According to Cary (2006) there is a connection between better and more frequent communication and increasement of parental involvement and engagement in their childrens' schooling. Parents' beliefs are often influenced by teacher-parent communication, and they benefit from well-organized teacher-led communication actions. Teachers who are taking actions to evolve instructional partnerships with parents, those parents thereupon are more likely to support their children's learning at home. Thereupon the students of these parents are more likely to be perceived by the teachers as positively involved in classroom learning activities (Olmstead, 2013).

According to Flessa (2008) parents are more positive and engaged when the school supports and practices open and honest communication, and at the same time, embracing parents as partners. Parents, on the other hand, wish to receive information which is clear and concise – information that will help them plan and organize their childrens' homework or other school activities in an efficient and effective way (Flessa, 2008; Joshi, Eberly & Konzal, 2005). By ensuring meaningful communication, parental involvement is shown to be increased. Keeping parents informed and inviting them to participate in their children's schooling, through meaningful communication is an important and essential factor when the goal is to increase parent involvement (Flessa, 2008; Wiseman, 2010). According to DeFur (2012), many parents also prefer communication from the school that shows and indicates care for their child, as well as communication that shows an understanding between them and the school. That influences parents as they are more likely willing to volunteer in and attend school activities. This also affects the children's attitudes towards the school, their homework completion rate and their attendance (Flessa, 2008).

2.4.2. The impact of parental involvement

The significance of parental involvement in schools and the connection to the children's achievement have been widely studied, and research shows that parental involvement and engagement in their children's schooling plays a significant factor in relation to children's achievements in school (Desforges, 2003; Duckworth, 2008; Harris & Goodall, 2008; Melhuish et al., 2008). Parental involvement has a positive effect and impact on children, families and schools, as it can help improve childrens' development, school performances and learning outcomes (Henderson & Mapp, 2002; Wiseman, 2010). Ramirez (2001) states that children tend to place a greater importance on education when parents are actively involved in their education. Henderson and Mapp (2002) found out that children are more likely to graduate from high school with high grades and test scores, enroll in higher-level programs afterwards, and more likely pursue post-secondary education, if they have parents who monitor their school work and daily activities, and frequently communicate with their teachers and help to develop their plans for their education or work after high school.

Home-based, rather than school-based, involvement in supporting learning has the biggest impact on student learning. Family involvement in young children's education is associated with positive development across a range of academic outcomes, including early literacy and language skills, motivation to learn, attention, task persistence, social skills, and positive behaviour at school (Arnold, Zeljo, Doctoroff, & Ortiz, 2008; Fantuzzo, McWayne, Perry, & Childs, 2004). Besides that, it is important to children's self-esteem and self-confidence as well (Machen, Wilson, & Notar, 2005). Nevertheless, many teachers and principals at school state that parent involvement is still lacking, and therefore it is an obstacle to students' achievement at school (Epstein et al., 2002).

2.4.3. Diversity within parental involvement

There are several different reasons why some parents are engaged in their child's education, and why other parents are not (Bandura, 1997). There could be several

different reasons why parents are not involved, including language barriers, their own lack of education, inability to understand the educational process, and lack of time due to their day-to-day responsibilities (Hall et al., 2005). Many parents find it difficult to manage both family and careers, and therefore they do not have enough time to be engaged in their child's school life (Constantino, 2003). In general, today's parents are often occupied with demands and distractions of daily life. Some parents are burdened by low-income, inflexible work hours and language barriers, and often therefore they are unable to participate in the schooling of their children on a regular basis (Ho, 2009). According to Bæck (2010) as well as Lee and Bowen (2006), cultural norms, insufficient financial resources, and lack of educational background can be barriers for parental involvement in childrens' schooling. Furthermore, many parents suffer from low self-esteem or they have not had success experiences at school themselves, and therefore they may lack knowledge and confidence to help their children (Davies, 1996). According to Greenwood and Hickman (1991), parents who did not experience success at school may view subjects regarding school negatively.

Hornby and Lafaele (2011) found several factors that influence and act as barriers for parental involvement. As for example, if parents feel that their involvement is not valued and expected by the school staff, they are less likely to be involved. Some parents, for instance, have negative perceptions of invitations from school staff, who are inviting parents to discuss their involvement in their childrens' schooling. However, lack of information and communication channels between school and home is the most critical of them all (Adams & Christenson, 2000). In some instances, teachers are not effective enough to foster school-home communication, due to the lack of skills that are necessary in order to engage parents (Flynn & Nolan, 2008).

2.4.4. Expectations, resources and skills regarding parental involvement

Grant (2009) found that *"teachers, parents, and children generally saw learning in and out of school as separate activities, and wanted to preserve the boundaries between them* (Grant, 2009, p. 300)." According to Akselvoll (2015), the schools digital involvement efforts take on very different meanings depending on the parents' everyday lives and that the intensification of the school-home collaboration can cause reproduction or amplification of social disparitie. The school's requirements for parental involvement require time, surplus and skills – skills to handle the amount of information, skills to handle the school activity plan and the unpredictability that comes with it and professional skills in order to be able to assist with homework (Akselvoll, 2015).

The required assistance from parents does not only concern homework or learning related school activities. Social initiatives related to the school such as being a parent who supports the school and helps at special occasions and social arrangements (Ministeriet for Børn, Unge og Ligestilling, 2016). To be involved in children's activities beyond homework and learning activities is today seen as least as important when it comes to parental involvement (Akselvoll, 2018). According to Akselvoll (2018), being involved in social life can be perceived as involvement in a 'light' version compared to being involved in learning activities. It is described as a not-competence-requiring form of involvement which means that all parents are equally qualified in order to accomplish that type of scholarly involvement. It could be, for example, baking a cake for a party, having the playgroup visiting or planning a trip. These types of parental involvement were discussed as something special, as well as important for the well-being in the class. The teachers did not have to encourage the parents to engage in these activities and the involvement in these activities were taken for granted as something valuable. Those parents, who did something particularly good for the community, were sometimes thanked for their involvement and participation. This indicates that the school perceived these types of involvement of high value and the parents could either be thanked in writing or in a school-home conversation. It can cause further or more obvious demarcations between those parents who have many social, economic resources and

those parents who lack these resources. Therefore the inequality between the parents and their resources for involvement in the school becomes more prominent (Akselvoll, 2018).

2.4.5. Summary

The nature of parental involvement in education has changed over time both in terms of the aspects of schooling where parents are expected to be involved in, and the intensity of their involvement at home (Reay, 2005; Selwyn et al., 2011). According to Cary (2006) there is a connection between better and more frequent communication and increasement of parental involvement and engagement in their childrens' schooling. Research shows that parents are interested in better and more frequent communication with the school, and that they want to help their children succeed at school (Henderson & Mapp, 2002). Parents can often be influenced by teacher-parent communication, and they benefit from well-organized teacher-led communication actions. Those parents that teachers are evolving instructional partnerships with, thereupon are more likely to support their children's learning at home, and thereupon the students of these parents are more likely to be perceived by the teachers as positively involved in classroom learning activities (Olmstead, 2013). According to Flessa (2008) and Wiseman (2010), parental involvement increases by ensuring meaningful communication. DeFur (2012) states that many parents prefer communication from the school that shows and indicates care for their child, and communication that shows an understanding. In these situations, parents are more likely to volunteer in and attend activities at school, and it affects the children's attitudes towards the school, their homework completion rate and their attendance (Flessa, 2008).

Parental involvement and engagement plays a significant role in relation to childrens' achievements in school (Desforges, 2003; Duckworth, 2008; Harris & Goodall, 2008; Melhuish et al., 2008). Parental involvement has a positive effect and impact on children, families and schools, as it can help improve childrens' development, school performances and learning outcomes (Henderson & Mapp, 2002; Wiseman, 2010).

Henderson and Mapp (2002) state that children are more likely to graduate from high school with high grades and test scores, thereafter enroll in higher-level programs, and to pursue post-secondary education if they have parents who monitor their school work and daily activities, frequently communicate with teachers and help develop their plans for education or work after high school.

Home-based involvement in supporting children's learning has the biggest impact on children's learning as family involvement in young children's education is associated with positive development across a range of academic outcomes, including early literacy and language skills, motivation to learn, attention, task persistence, social skills, and positive behaviour at school (Arnold, Zeljo, Doctoroff, & Ortiz, 2008; Fantuzzo, McWayne, Perry, & Childs, 2004). Besides that, it is important to children's self-esteem and self-confidence (Machen, Wilson, & Notar, 2005).

Some parents are actively engaging in their childrens' education, and some parents are not, and there are several different reasons for that (Bandura, 1997), including language barriers, their own lack of education, inability to understand the educational process, low income and lack of time due to their day-to-day responsibilities (Hall et al., 2005). Adams and Christenson (2000) state that if parents feel that their involvement is not valued and expected by teachers or schools, they are less likely to be involved.

2.5. Information and Communication Technology (ICT)

The nature of communication has changed significantly due to the appearance of the Internet and mobile communication over the last few decades, leaving an impact on people's lives, well-being and relationships. It may have many potential benefits such as enabling people to stay in touch with family members and friends across the world more easily and quickly (Goodman-Deane et al., 2016). Online communication builds up and augments existing social ties, thus helping to strengthen relationships (Lenhart, Purcell, Smith and Zickuhr, 2010). However, different technologies have different

effects, depending on how the technology is used (Valkenburg & Peter, 2007), and it might have different effects on different people (Shklovski, Kraut & Rainie, 2004).

2.5.1. Convergent ICT

Convergent ICT use plays an important role in people's lives in order to achieve symmetrical communication. As new technology constantly is being innovated, ICT innovations will continue to alter the channels, devices and strategies individuals use to communicate with one another and thereby also alter how individuals prefer to communicate with one another (Rogers, 2003). As the societal development of tools for online and digital communication increases, the social expectations towards the use of these ICTs also increase (Lenhart et al., 2010).

Technology such as cell phones, e-mails, texts, and mass notification systems are examples of ICTs which can be used for quick communication due to the ease of use and timely nature (Chaboudy & Jameson, 2001). According to Wright (2001), by providing new and more efficient ways of communication possibilities, distribution, display and storage, ICTs can be used to improve communication.

2.5.2. ICT for school-home communication and collaboration

Use of computers and the Internet is continuously increasing in schools and in people's private lives (Gu, 2017) and digital technology usage is playing an important role in parental involvement (Selwyn, et al., 2011). Many parents report that they often hear little from their children about school activities and what is happening at school. In continuation of this, parents announce that they would be open to use digital technologies such as email and text messaging in order to communicate with the school (Byron, 2009). Choosing the essential and appropriate technology and channel for communication is therefore essential in order to increase the efficacy of school-home communication and encourage parental involvement (Heath, Maghrabi, & Carr, 2015).

On the other hand, lack of communication can result in distrust and misperceptions (Bryk & Schneider, 2003).

Already existing and emerging electronic communication technologies can provide the capabilities for schools and institutions to increase parent involvement in their children's academic lives. In this way schools should be seeking ways to maximize emerging technological tools in order to promote better communication between teachers and parents. However, this is not the reality and there are several reasons for that including the fact that teachers are lacking training in terms of how to use technology in order to improve communication between school and home (Olmstead, 2013).

Digital technology usage differs at home and at school, even if the digital education is used for educational purposes (Kerawalla & Crook 2002; Facer & Kent, 2004). According to Hollingworth, Allen, Kuyok, Mansaray and Page (2009), some technologies can be more useful for school-home communication than others, depending on the communicational purposes. Parents have, for instance, reported that by using portable tablet PCs it was possible for them to align home educational activities with school and that it was possible to adopt the same agenda as at school (Kerawalla & Crook 2002).
In order to provide parents with resources to engage in children's learning at home, online textbooks, teacher websites, as well as links to educational websites, which include videos and games, can be used. Furthermore, emails provide them with two-way communication when they need to pull information or respond after their needs (Olmstead, 2013).

2.5.2.1. Two-way communication

Meaningful, direct two-way communication is an essential element when it comes to parental involvement (Henderson & Mapp, 2002; Murphy, 2013). As parents can have different needs for communication, it may be needed to use multiple types of ICTs in terms of achieving the best possible efficacy. In order to be able to fit the ICTs to the

parents' needs it is essential to understand the difference between parents as well as the difference between the schools' needs and the parents' needs and preferences. Schools and parents may not have the same needs for specific types of communication or the same needs for use of ICTs (Cary, 2006).

The ideal form of two-way communication should be symmetrical and based on collaboration and cooperation, where both parties should be willing to adapt and be committed to the ongoing relationship (Cary, 2006; Grunig & Grunig, 1992). Two-way communication can be interpersonal or it can be mediated through other mediums which have a dialogic function, for example email, social media, websites, surveys, interactive voice response systems or other types of ICTs (Grunig & Grunig, 1992; Chaboudy & Jameson, 2001). Two-way communications are designed to establish a dialogue between, in this case, the school and home (Cary, 2006; Grunig & Grunig, 1992; Kent & Taylor, 2002). The purpose with this dialogue is to establish a mutual beneficial, satisfying and collaborative relationship between school and home, which invites both parties to exchange meaningful messages and where the input from the parents (home) are valued and sought after by the decisions making processes made at school (Grunig & Grunig, 1992).

2.5.2.2. Websites for school usage

Today, schools use diverse Internet tools to inform and communicate with families, including the school's website (Jensen, 2007; Thompson, Mazer & Flood Grady, 2015). It can be seen as a window to the school, which serves as a prime location for public advocacy and information, particularly for parents' use (both existing parents and prospective or potential parents). The way school websites are built, to some extent, reflects the school's beliefs, intentions, and strategies to communicate and collaborate with families. School websites often provide timely feedback for parents, and support communication between school and home when utilised to their fullest capabilities (Lunts, 2003).

Even though many schools and institutions have websites, parent, teacher and principal perceptions differ in terms of the use of websites for communication purposes. This discrepancy may lie in the difference between pushing information out to parents, as well as allowing the parents to pull the information that they need. Furthermore, parents' and teachers' understanding of the use of the Internet may lie in the differing perceptions of what they think that needs to be communicated, and how often it needs to be communicated. Many schools push information to parents, but they do not provide any means for parents to share information. Instead of doing that, schools should enable parents to pull information when needed, or give an opportunity for them to communicate with the school after their needs, which is normally allowed by using technology for communication purposes (Hagel & Brown, 2005).

One of the important advantages of using a school website is that websites are able to convey information to multiple families, efficiently share and archive information about students' learning and progress, school policies and assignments, and tips for family involvement (Goodall, 2016; Olmstead, 2013). Hartshore, Friedman, Algozzine, and Kaur (2008) state that school websites mainly have two major functions: they serve as an information system for site visitors, and they act as an intermediary between the different stakeholders (Hartshore et al., 2008).

2.5.2.3. Learning platforms

During the 2000s, some schools have developed online 'intranets' and 'managed learning environments' in order to allow parents to access resources and information related to their children's education, thereby easing the transfer of school work into home. Some schools have also made use of various modes of computer-mediated communication, such as email and mobile phone-based text messaging, with children's parents. Some schools have even lent portable devices to families, such as computers and other personal digital devices to ensure that all students and their parents have access to technology at home (Selwyn, et al., 2011).

In the 2010s schools around the world have been encouraged to develop and maintain integrated 'learning platforms'. The main purpose for that is to give all members of the school community access to learning resources, encourage them to communicate and collaborate with each other, and allow access, monitor, and report on student progress. In the 2000s, primary and secondary schools in the UK started to develop learning platforms. Similarly, the development of shared learning spaces and virtual learning networks were developed in New Zealand. Learning platform technology has afterwards spread to Northern Europe. One of the examples is the Estonian 'ekool' learning platform that is now used widely in Estonia and Sweden. It offers a shared management information system (MIS), virtual learning environment (VLE), and computer-mediated communication environment for learners, teachers, parents and managers. Today, the majority of schools in Denmark, Finland and Norway also use some form of Learning Management system (Selwyn, et al., 2011).

All the examples mentioned above can be classed as variations of 'learning platform' technology. The concept of a school's learning platform relates to the integrated development and use of a number of different digital applications and tools. In particular, it involves the integrated use of a school's MIS to support recording and sharing of data between school management, teachers, students and their parents. VLE is integrated in the school system in order to allow students and teachers to engage in learning activities through the creation and sharing of online learning resources, communication and collaboration between individuals and groups, as well as the assessment and grading of work (Selwyn, et al., 2011).

A school's learning platform should allow for the seamless inclusion of parents into all aspects of their children's schooling through the integrated use of these technologies. According to Grant (2009), political efforts to increase the use of these technologies in schools are not merely technical or logistical in nature. They are *"part of a wider strategy to inspire parents to support conversations with their children about their learning"* (Grant 2009, p. 3).

2.5.2.4. User Diversity

Lazarus and Lipper (2005) highlighted the significance of guidelines that help to establish a consistent, equitable and credible system in order to meet the needs of different groups of website users.

The increasement of parent involvement is closely related to the digitalization of the communication between school and home. An article written by Maria Ørskov Akselvoll deals with parents' perceptions of communication through ForældreIntra, a former collaboration and communication system used in primary public schools in Denmark, which today has been replaced by a new communication and collaboration platform Aula (Akselvoll, 2015). Depending on resources, parents have different approaches to involvement in their children's school. Some parents are very engaged in the role of ´school assistants´ and they work purposefully to fill the role as good as possible, even despite a busy lifestyle. They saw ForældreIntra as a great and supportive tool for their children's school activities, but they were also critical to aspects of the system, for example that ForældreIntra places demands on them as parents. The large amount of information could sometimes be stressful, but more interviewees mention that they at some point were able to handle the amount of information. Some of the parents even saw the system as an important tool and an indispensable way of being informed of their children's schooling, especially those parents who did not get much information directly from the child itself. Parents therefore saw ForældreIntra as a necessary tool in order to be able to be updated on their children's schooling. Several parents pointed out that they were afraid to miss out on important information and feared that it would cause their child to not be well enough prepared for the upcoming school days (Akselvoll, 2015).

Akselvoll (2015) describes two types of parents. Those who try to be at the forefront and those who distance themselves more from the role as so-called 'school assistants'. The parents who had a more distant relationship to Forældreintra, did not think that they as parents should take on all the responsibility regarding their childrens' schooling themselves. They tried to keep a certain distance to ForældreIntra compared to the

parents who at a greater extent made an effort to be at the forefront regarding Forældreintra and their children's schooling. The forefront parents were characterized by being very conscientious and responsible towards ForældreIntra. They had a longer higher education and could use some of their competences from their working lives when organizing and planning the use of ForældreIntra. Another characteristic was that these parents typically had more financial resources compared to the more distant parents (Akselvoll, 2015).

2.5.2.5. Expectations, skills and resources regarding use of ICT

The distanced parents also wanted their children to get the best possible schooling, but they were more skeptical about having to get involved in school activities. The boundary between school and home was clearer, and ForældreIntra was seen as an obstacle rather than an opportunity for them. They described the system as messy, cumbersome and time consuming, and criticized the large amount of activity in the system. There was a dislike towards having to be available for the school all the time. Parents described the large flow of information, and the teacher's expectations of them, as unreasonable. If they have a routine checking ForældreIntra for new information in the afternoon, they can miss information if the teachers subsequently choose to send out information, for example at 9 PM. These parents choose to ignore notifications and messages, or choose not to act on the information regarding homework and other invitations to parental involvement. Whether they got ForældreIntra checked for new messages or kept themselves updated on the weekly schedule was often random. Sometimes they forget to check the weekly schedule and it results in a quick check for the most important information or updates (Akselvoll, 2015).

Parents established a certain routine around checking ForældreIntra. Some parents both check it in the morning and in the evening, or when they leave their workplace in the afternoon, in order to be sure to be updated on important information. The childrens' weekly schedule, containing the children's schooling activities, which was to be found on ForældreIntra, was sometimes used as a checklist in relation to the children's

homework. Some parents printed out the weekly schedule in order to keep it in a physical form (Akselvoll, 2015).

In general all the parents could relate to being too tired to check for information or just not having the urge to. On the contrary, they clearly understood what the teachers and the school expected from them, but they chose actively not to take on the responsibility. According to this type of parents, it is the school's own responsibility whether the teaching is successful or not. These types of parents place more responsibility regarding schooling and learning on the children, compared to the more resourceful parents. They stated that it was the children and not them who attended the school, and that the children therefore also should be responsible for the weekly schedule. These parents, unlike the forefront parents, were not afraid to miss out on information. In general the parents found that the weekly schedule was confusing and they felt powerless in relation to helping their child with homework, because they did not have the professional skills in terms of being able to help their child learn and understand the homework. They did not understand how to teach or did not feel they had the skills or abilities to assist with homework. Besides lack of competencies, they did not have enough surplus or energy to be able to be involved in the school due to personal challenges in their everyday lives. They were more focused on what happened here and now and did not focus on what significance their distant relationship with the school would have for their children in the long run (Akselvoll, 2015). Maria Ørskov Akselvoll concludes that there is a discrepancy between these parents' priorities and the schools requirements and overall agenda. Patterns in the study showed that none of these parents had completed an education beyond high school and were either receiving cash benefits or had jobs with modest incomes (Akselvoll, 2015).

2.5.2.6. Design & Usability of ICT

When designing a webpage for ICT usage, it is significant to consider technical elements and design, as functionality is critical for continued website usage (Pearson & Pearson,

2007). Hartshore et al. (2008) suggest technical and navigational elements of a website, including features such as contrast, repetition, alignment, and proximity.

Any website should be informative, usable, accurate, and effective for public use. There are critical aspects regarding the functional features of the website that need to be evaluated (Epstein, 2009). Parajuli (2007) defined the critical measurement determinants consisting of *transparency, interactivity, accessibility,* and *usability. Transparency* refers to the relevance, richness, and openness of information on a website, and it measures the characteristics of the website in terms of its legitimacy, accountability, and trust. Furthermore, *interactivity* relates to two-way communication, including channels for online direct communication in the form of feedback, chat, discussion and an interactive bulletin in order to target a larger audience. *Accessibility* relates to the attribute of being easy to deal with. Any website should be accessible to anyone in order to meet different requirements from different users regardless of their personality, expertise, disability, ethnicity, and literacy. Online technical support, multilingual options and FACs can increase accessibility on a website. *Usability* focuses on user-friendliness of a website in terms of structure of navigation, freshness, search engine or links and so on. A site map and direct links or "home" and "back" buttons provide quick and efficient transitions between different sections of the website. To improve the usability of a website in terms of aesthetics and variation, a combination of text and images of diverse kinds, such as photos, audio/video and animation can be used (Parajuli, 2007).

2.5.3. Summary

Wright (2001) states that ICT can be used in order to improve communication as it provides efficient ways of communication possibilities, distribution display and storage. Moreover, Gu (2017) reports that computers and the Internet are continuously increasing in schools and in people's private lives, and digital technology usage is playing an important role in parental involvement (Selwyn, et al., 2011).

Many parents report that they often hear little from their children about school activities and what is happening at school, and they are open to use digital technologies such as email and text messaging in order to communicate with the school (Byron, 2009). According to Henderson and Mapp (2002) and Murphy (2013), direct two-way communication is an essential element when it comes to parental involvement. Cary (2006) states that multiple types of ICTs can be used to facilitate effective communication between school and home as parents and school have different needs for communication. Email, social media, websites, surveys, interactive voice response systems or other types of ICTs can be used for two-way communication between school and home as they provide a dialogic function (Grunig & Grunig, 1992; Chaboudy & Jameson, 2001). The purpose with this dialogue is to establish a mutual beneficial, satisfying and collaborative relationship between school and home, which invites both parties to exchange meaningful messages and where the input from the parents (home) are valued and sought after by the decisions making processes made at the school (Grunig & Grunig, 1992).

However, parent, teacher and principal perceptions differ in terms of the use of websites for communication purposes. This discrepancy may lie in the difference between pushing information out to parents, as well as allowing the parents to pull the information that they need. Many schools push information to parents, but they do not provide any means for parents to share information. Schools should enable parents to pull information when needed, or give an opportunity for them to communicate with the school after their needs, which is normally allowed by using technology for communication purposes (Hagel & Brown, 2005).

In the 2010s schools around the world have developed and maintained integrated learning platforms with a purpose to give all members of the school community access to learning resources, encourage them to communicate and collaborate with each other, and allow access, monitor, and report on student progress (Selwyn, et al., 2011).

According to Akselvoll (2015), parents have different approaches to involvement in their children's school depending on resources. Some parents are very engaged in their

childrens' schooling while others are less engaged and involved. While some parents think that a large amount of information that is shared between school and home could sometimes be stressful, others can handle the large amount of information. Parents value ICT as an important tool to use for school-home communication and collaboration as they feel that it keeps them updated about their childrens' schooling. There are many parents who are afraid to miss out on important information and fear that it would cause their child to not be well enough prepared for the upcoming school days (Akselvoll, 2015).

When designing a webpage for ICT usage, technical elements and design have to be considered as functionality is critical for continued website usage (Pearson & Pearson, 2007). Hartshore et al. (2008) suggest technical and navigational elements of a website, including features such as contrast, repetition, alignment, and proximity. Any website should be informative, usable, accurate, and effective for public use (Epstein, 2009).

3. Data collection

This chapter presents our data collection methods and procedures. It also provides a presentation of our sample as well as a description of the data collection process. The methodology about semi-structured interviews and contextual inquiry are explained separately, but as the semi-structured interviews are included in the contextual inquiry sessions, the description of the data collection process combines both of them. Finally, our reflections regarding reliability and validity, as well as ethical considerations are described.

3.1. Population & Sampling

According to Field and Hole (2003), it is essential to choose the right population for any research because each population has its own characteristics, and populations can vary from being very general, more specific or extremely specific. Population for this research are children's parents who use Aula. However, due to constraints of time, ability and scope of the thesis, it is not possible to reach everyone within the population, therefore data could be gathered only from a small subset of the population, which is also known as sample (Field & Hole, 2003). The sample should be as large as possible to represent the population, and it has to be representative for the findings and results to be generalised to the entire population (Bryman, 2012a).

Purposive sampling is one of the most used sampling within qualitative research where units (people, organisations, etc.) are selected with direct reference to the research question being asked. Accordingly, the research question often guides to choose on what categories of people should the focus be on and who should be sampled (Bryman, 2012a).

For this research we have used the purposive sampling and chosen to focus on 1) parents who use Aula on their daily basis in order to follow up with their childrens'

schooling; and 2) parents who use digital technologies on a daily basis and are familiar with them. There is no limitation with the parents' age, so long their children are connected to Aula, and parents have access to Aula themselves. Additionally, our sample includes both males and females. The characteristics of the sample mentioned above are not strictly defining it, but still provide an overview of individuals who were included in the population for the study to yield relevant results.

Initially, the sampling was supposed to be found through social media channels such as Facebook, where invitations to the interview were posted in different groups where parents that use Aula could possibly be reached. However, only one person responded, and therefore the sample was later selected based on *a snowball sample*. The snowball sample is a sampling technique where individuals or a small group of people who are relevant to the research question are proposing other participants who could be relevant to the research (Bryman, 2012a).

For this study we collected data from eight participants, from whom four are male and four are female, which makes the gender distribution within this research even. Figure 5 underneath represents the data collected, indicating participants' age, gender, marital status, and profession. Besides that, it also indicates how many children they have, how old they are and which grade they are attending.

Participant nr.	Gender	Age	Marital status	Profession	Amount of kids	Grade kids are attending
1	Female	45	divorced (shares kids with ex-husband)	An editor-in-chief	3	0., 2., 5.
2	Male	43	married	Self employed	2	5. and 7.
3	Male	32	married	Busdriver	3	0., 2., 5.
4	Female	40	married	Doctor	2	0. and 3.
5	Female	39	married	Sick-leave	2	0. and 7.
6	Male	41	married	Shop assistant	2	7.
7	Female	50	married	Teacher	5 (only 2 affiliated with Aula)	3. and 7.
8	Male	45	married	Self employed	2	2. and 5.

Figure 5: Presentation of our sample.

The participants' ages range from 32 to 50 years. The majority of the respondents are within their 40s', and the average age of the participants is 41 years. Most of the interview participants are married and live together with their children, except one participant, who is divorced and shares her kids with their father. There are various different professions among the participants that vary within its' responsibility and flexibility. All the participants have at least one child who is affiliated with Aula. However, most of the participants have two kids, while some have three, and the kids are currently within 0. and 7th grade. All the participants possessed the main characteristics of the population, making this sample to be also a purposive sample.

3.2. Contextual inquiry & semi-structured interview

In order to gather useful data from parents who use Aula, we have chosen to use contextual inquiry in combination with a semi-structured interview. We chose these two

data collection methods in order to collect detailed user-centred information about how the participants use Aula. We asked questions and observed participants, as well as asked them to show us examples explaining specific situations and functions within Aula. Combination of these methods helped us to not only get detailed information from them, but also to understand participants and their actions, that could possibly help us to find correlations between their actions later on in the process.

Further, each of the data collection methods will be explained separately more in detail.

3.2.1. Contextual inquiry

Contextual inquiry is a qualitative research method that helps to understand and provide information about how participants perform certain tasks (Holtzblatt & Beyer, 2016a). The method was developed and refined in 1986 at Digital Equipment Corporation based on ideas from digital employees and other professionals within the human-computer interaction field. The method is becoming more useful when gathering user data as the digital world is continuing to thrive. Contextual inquiry provides detailed information about the target audience, as well as why they use or not use specific products or features within these products. As a data research method, it could be used by itself or in combination with other data gathering methods (Holtzblatt & Beyer, 2016a).

Depending on the type of the project and information needed, a contextual inquiry has several different implementations, and there is not only one right way to conduct contextual inquiry. According to Raven and Flanders (1996), there are three different implementations of conducting a contextual inquiry as following:

1. ***Work-based interview.*** This is the most traditional method of contextual inquiry. It is useful to choose this method in case of participants giving allowance for an interviewer to observe and interview them while they do actual work or engage in an activity.

2. ***Post-observation inquiry.*** Within this type of method participants cannot be interrupted. It means that researchers can only observe them while they are doing their tasks. After they complete their tasks, they can answer interview questions.

3. ***Artefact walkthrough.*** This is the most common method for studying user information. It involves asking participants to recreate a specific process for research purposes. While doing that, participants should use artefacts from the actual processes in order to stimulate their recollection.

Due to the fact that all the contextual inquiry sessions were conducted online, a work-based interview and post-observation inquiry were automatically excluded, and that is one of the reasons why we chose to use artefact walkthrough. However, the main reason for choosing artefact walkthrough as the implementation method for conducting contextual inquiry is the fact that we cannot interview participants within those moments when they actually check Aula as it can be done in any time and any situation throughout the day, and we cannot follow them in order to conduct contextual inquiry and interview them. As artefact walkthrough helps to recreate specific processes using artefacts, it helped the participants to recollect those processes and explained them to us.

3.2.2. Semi-structured interview

Interview is a data collection method that is often used within qualitative research as it provides researchers with useful data (Bryman, 2012b). Even though there are many different types of interviews to conduct, *a semi-structured interview* seemed the most suitable for this research in order to get a deeper understanding and gather insights of what challenges parents experience when using Aula, as well as what are their overall experience using Aula.

Within *a semi-structured interview* a researcher often has a list of questions or specific topics that needs to be covered throughout the interview, that is often referred to as an interview guide. Questions within the interview may not always follow the exact structure as outlined beforehand, as the interviewer might ask some questions earlier or later than planned, depending on a specific situation and the flow of the interview. Some questions could be skipped if an interviewee might already answer the question. If necessary, the researcher might ask questions that are not planned beforehand or included within the interview guide. Overall, all the questions that have been planned beforehand are asked within the interview (Bryman, 2012b).

The fact that semi-structured interviews are flexible in terms of changes within the order of the structure (Bryman, 2012c) was another reason why we chose to conduct this type of interview. The flexibility within the interview structure is important for us as we can ask questions depending on the flow of the interview - sometimes asking some additional questions if necessary, or asking a specific question earlier than planned within the interview guide.

The main goal of the interviews was to investigate what experiences the parents are getting when using Aula, what they are missing within the system, their general opinion about it, and which parts of the system they think need improvement or changes. Besides that, we also aim to find out if there actually is anything within Aula that works well, and therefore might not need changes and improvements. Besides the functionalities and user experience of the system, we also focus on the general design of the system, asking the participants what they like or dislike. By interviewing parents, we can find out what their behavior and needs are in order to improve Aula, and to make the user experience better when using it.

We believe that contextual inquiry in combination with a semi-structured interview are the most useful research methods in order to get the most valuable qualitative data for this research.

3.2.3. The initial draft of the interview

The interview includes topics that have been covered within literature review, and each of the topics were discussed by asking several questions to the participants. Initial draft of the interview consisted of 45 questions (See Appendix 5 - Initial draft of the interview). The first six questions were general questions where we asked participants to tell us about their family, school and children. Further we asked four questions regarding parent involvement, where we wanted to find out how the families are dividing responsibilities among each other. Moreover, we asked five questions about school-home collaboration and communication where we asked the participants to tell us about their experiences with school in regards to their collaboration and communication. After that followed 13 questions about Aula to find out what are their opinions about it, how often and when they log into the platform, what are their opinions about the information sharing within Aula and so on. Furthermore, we asked four questions about ForældreIntra to find out what experiences the participant had with the old platform. After that, we continued to ask questions about Aula, including 13 questions that focused mainly on functions within Aula, their experience and opinions about them, design of Aula and possible recommendations for improvements.

3.2.4. Pilot test

The initial draft of the interview (See Appendix 5 - Initial draft of the interview) has been tested in a pilot testing interview in order to determine if our questions are appropriate. Pilot test helped us to define which questions functioned well, which questions could be combined, and which questions needed to be changed or skipped. The results from the pilot test helped us to further organise and build the interview questions within a better structure. Besides all the advantages we gained through the pilot test, it also increased the validity of the research (Bryman, 2012d).

The pilot test helped us to understand that the interview guide needed to be changed. We understood that we had included too many questions that were similar, and we

repeated ourselves several times due to the similarity of the questions. We have therefore decided to combine some of the questions, and thus we would not need to repeat ourselves multiple times. We have rearranged the structure of the interview differently, which made the flow of the interview better.

Already throughout the pilot test interview we could see that the participant was actively showing us Aula, navigating around the app while answering questions, and telling stories about different situations she has experienced. We could easily see that artefact walkthrough helped the participant to recall her memory, and it was useful to look at Aula while telling us about her experiences with Aula.

Pilot test proved that the duration of the interview was fine, and it fit within the time scope we had planned beforehand. We have informed the pilot test participant that the interview will last approximately 45-60 minutes. Even though the participant gave long and detailed answers to the questions, and was very active within the interview in terms of showing examples within Aula and explaining her experiences with Aula in detail, we managed to complete the interview within 65 minutes.

We have tested our roles within the pilot test, where one of us is a moderator who engages in the conversation with the participant, while the other person is taking notes, recording the audio and video of the interview, and is generally responsible for the technical part of the session. We have decided that it is better that only one person is interviewing the participant, and thus we do not interrupt each other underway. We decided that we will keep the same procedure, just switching roles - one time one of us is the moderator, while the other is responsible for the technical part, and the other way around.

3.2.5. Interview guide

After the pilot test session, we have made a new and revised version of the interview guide (See Appendix 6 - Interview guide). Overall, most of the questions were kept, but

some got discarded or combined with other questions, avoiding repetitive questions. In total we ended up with 42 questions. The introduction part of the interview consists of seven questions where the participants were asked to tell about their family, children and children's school. Furthermore, we asked the participants four questions regarding parent involvement to find out how involved they are within their children's school and what are their responsibilities in regards to that. Moreover, we asked four questions about school-home collaboration and communication to find out how satisfied they are with their children's school and collaboration with them, how they communicate with the school and if they ever miss some information from school. Within the last part of the interview we asked 23 questions regarding Aula to find out how satisfied the parents are with the platform, how they use it, and how often and when they use it, what they think about it's design and usability, what are the advantages and disadvantages of Aula and if they have some recommendations in mind in order to improve Aula. As the last part of the interview, we asked four questions regarding ForældreIntra, but we asked these questions only to parents who had used it, which in our case was everyone. Reason for asking questions about ForældreIntra was to find out if there are any functions from ForældreIntra that parents miss in Aula.

3.2.6. Procedure

Due to the pandemic situation caused by Covid-19, all the sessions were conducted online in order to avoid face-to-face contact with people, and respect safety recommendations that had been instructed by the Danish government. All the sessions were conducted using Zoom[2] video calls where we could see the participants, and they could show or share their screens with us.

The sessions were screen-recorded, as well as audio recorded. That has been done for safety reasons in case something happens with screen recording or audio recording, so we could have a backup.

[2] Zoom is the leader in modern enterprise video communications, with an easy, reliable cloud platform for video and audio conferencing, chat, and webinars. https://zoom.us

In the beginning of each interview, we have introduced the participant with the research project, shortly presenting what we are doing and for what reason we have invited them for the interview. After that, we have asked them for an allowance for recording them to make the interview transcripts later on in the process. Finally, we have asked them to orally sign the consent form (See Appendix 7 - Consent form) in order to give us allowance to use their data. It is important to mention that the consent form was sent to the participants several days before the interview to give the participants the opportunity to read the consent form and familiarise with the project and its process regarding data collection. From the beginning of the interview, as well as in the consent form that has been sent to the participants before the interview, we informed the participants that they should log into Aula, and that during the interview we would ask them to show us examples within Aula. For example, if the participant is talking about some specific function, he or she should show it to us within Aula, so we could better understand the things the participant is explaining. Besides that, the interviewee can better recollect their memories when interacting with Aula while being asked about different parts within the system.

Furthermore, we conducted the sessions, using the interview guide (See Appendix 6 - Interview guide) as a guidance tool, but in case of necessity we also asked additional questions depending on the situation or the participant's answer. Sometimes we asked additional questions to understand the meaning of what participants were saying to ensure that we understood them correctly. In other cases we asked the additional questions as we felt like that we could get some additional information from participants that could be useful later in the process.

As mentioned earlier, one of us was a moderator who asked the questions and engaged in the conversation with the participant, while the other was taking notes and recording the session. The roles were switched each time we conducted interviews.

Most of the interviews were conducted in Danish, except one which was conducted in English. The reason for conducting the interviews mainly in Danish was the language

barrier as most of the participants master Danish language, but not everyone could manage to take interviews in English as they felt more comfortable answering questions in the language Aula is designed in.

Contextual inquiry in combination with a semi-structured interview provided us with useful information in order to understand the participants better, as well as understand the functions in Aula. It gave us a lot of necessary information to better understand the challenges and experiences parents are having when using Aula.

3.3. Transcription

In order to transcribe the interviews, we have divided the 8 interviews between us. As we are two researchers transcribing, and we therefore needed to ensure the consistency in the transcriptions (See Appendix 8 - Interview transcripts), we agreed on how to transcribe on beforehand. In order to not miss any meanings of the interviewees statements, the interviews were transcribed verbatim and in order to get a thorough reproduction of the interview situation as possible (Kvale & Brinkmann, 2015b).

In the transcriptions *(...)* is used to indicate that the sound during the interview is unclear and we cannot hear exactly what has been said. Follow up questions and comments from the interviewer are referred to with the number of the original question followed by a letter in the alphabetical order (9.a., 9.b., etc.). *[ ]* is used to indicate that the statement has been said before the interview began (e.g. [Intro talk]).

The transcriptions contain personal information such as names, job descriptions and place of residence. In order to ensure confidentiality, to ensure that interviewees cannot be recognized and identified, the video and sound recordings were stored safely on our own personal computers, which only we have access to, and deleted after we transcribed the interviews (Kvale & Brinkmann, 2015b).

3.4. Reliability & Validity

Reliability concerns the question *"...whether the results of a study are repeatable." (Bryman, 2012e; p. 41)*. Replicability is related to reliability as it concerns whether other researchers are able to replicate the findings of other research studies, which means that if researchers do not document their research in detail it can be difficult for other researchers to replicate the findings of a specific study (Bryman, 2012e). Regarding qualitative data, it can be difficult to replicate data as the social settings are likely to change over time. Due to our data collection method semi-structured interviews, where we as researchers are allowed to ask follow-up questions, we can therefore argue that it will be difficult for other researchers to replicate the data, which means that the reliability of our data is decreased.

As interviewing, according to Kvale & Brinkmann (2015c), is a craft and one can therefore argue that validity is something that depends on the quality of the researchers' competencies throughout the interview process. Validity is, in a broader sense, about whether one examines what one intends to examine and to what extent the observations reflect the phenomena or variables that the researchers are interested in (Kvale & Brinkmann, 2015c). As we were not able to control the answers the interviewees gave us, they might therefore only have shared the experiences that they felt comfortable sharing with us, which might have affected the internal validity. Conducting the interviews in both Danish and English might also have an affect on the internal validity as there can have been language barriers, which causes us to understand the interviewees statements differently than intended by the interviewees. Regarding external validity, which concerns whether our study is generalizable (Bryman, 2012g), we can argue that it will be difficult to generalise our results as we have used a small sample counting 8 Aula users, whereas the target population counts approximately 2 million Aula users (Implementering af Aula, n.d.).

3.5. Ethical considerations

When conducting research where people are involved, several ethical considerations must be taken into consideration. We must ensure that our research complies with the Danish code of conduct of research integrity in order to guarantee proper practice (Ministry of Higher Education and Science, 2014). The main reason for that is the fact that we have to treat our participants within a respectful and ethical manner (Bordens & Abbott, 2011; Bryman, 2012f). In order to do that, we have taken the approach from the Belmont Report in consideration, which consists of three principles of ethical treatment when humans are involved in research (Bordens & Abbott, 2011):

- **Respect for persons:** Participants should voluntarily participate in a research project, and they should be informed about what and how the research is going to happen, and that they are fully allowed to make their own decisions and opt out of the research if they change their minds.

- **Beneficence:** Beneficence must be maximized, as well as the well-being of the participants must be protected.

- **Justice:** Potential benefits, cost and burdens must be shared between the researchers and participants of the project.

Furthermore, we created a consent form, which was used whenever people contributed to our research. The consent form (See Appendix 7 - Consent form) briefly explains to the participants about the purpose and expected goal of this research, its methodological framework and the anonymity of the participants' data. The participants must read and sign the consent form before returning it back to us. As the interviews were conducted online, the participants signed the form verbally, and it was recorded, except one interviewee, who signed consent form and sent us back after the interview. Additionally, we treat the participants' data protected and confidential, and after the

thesis is completed and defended, the data collected from the participants will be deleted from our computers.

Define stage

presents how the collected data is analysed, and what we have found out. Within this chapter we explain all the different processes and methods used in order to analyse and categorise the data into themes in order to define problems within Aula. In the end of this stage, we present HMW questions that helped us to frame the insights into opportunities in order to find a design solution for this research.

4. Analysis & Results

The following sections within this chapter present and provide a description of our empirical foundation and explanation of how we have applied meaning condensation and affinity diagramming in order to analyze our qualitative data. To obtain a thorough understanding of the problems the participants experience when accomplishing tasks in Aula, we have used use case diagramming in order to help us capture the essential user requirements. The user requirements are presented at the end of each section of analysis. Furthermore, *How Might We …?* is applied at the end of the define stage as a method to help us brainstorm on possible design solutions. Figure 6 below illustrates the analysis process.

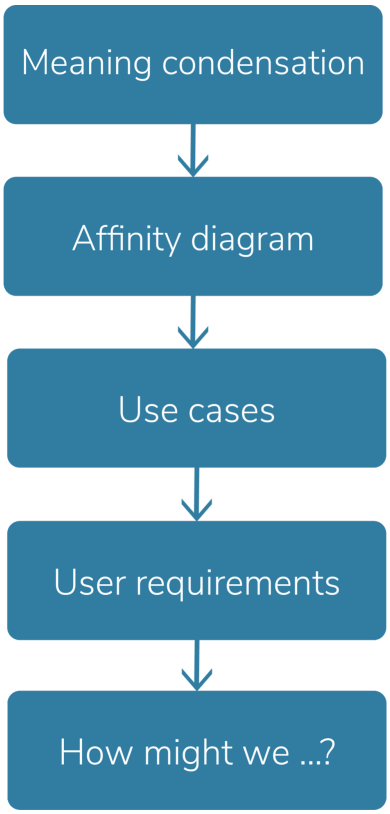

Figure 6: Analysis process.

4.1. Meaning condensation

In order to analyse the interviews we use meaning condensation (See Appendix 9 - Meaning condensation) as one of our analysis methods. According to Kvale & Brinkmann (2015d), meaning condensation involves shorter formulations of the interviewees' statements. The statements are compressed to shorter statements, with the purpose of capturing the central meaning. The interviewees' formulations are being reformulated with other words into fewer words, but without turning them into quantitative terms (Kvale & Brinkmann, 2015d).

We individually read all the interviews in order to capture the essential theme of each interviewees' statements. Afterwards we organised the data in an affinity diagram, where the interviewees' statements were themed from the interviewees point of view, as understood by us as researchers (Kvale & Brinkmann, 2015d). Meaning condensation helped us to elicit the essential information and thereby capture the participants' needs regarding Aula.

4.2. Affinity diagram

Affinity diagram is a technique that can help to structure and categorize data, and conceptually group information (Cohen, 1988). The main reason for using the affinity diagram is to bring together insights and user experiences into a diagram in order to reveal the scope of the problem (Holtzblatt & Beyer, 2016b).

Often affinity diagrams are used as a starting point for design (Koskinen, Zimmerman, Binder, Redström, & Wensveen, 2011), as the technique can help keep design teams grounded in the data as they design (Hanington, 2012). The process of affinity diagramming itself is generative as it helps to further create knowledge about the ideas. Finding likeness helps to manage and organize a seemingly overwhelming task as different data points are then grouped into themes. The output of the affinity diagram then helps to visualise connections and patterns (Kolko, 2011).

In order to create an affinity diagram, we have used the recommended steps from Hanington (2012) and Mayhew (1999) which are presented below.

As a starting point for creating an affinity diagram, team members need to write data - each statement on a separate piece of paper or a sticky note. After that, all the notes need to be shuffled and spread out on a table or any other large space, and all the notes should be read several times. Then all the notes and their underlying meaning should be interpreted, and after that they should be put up on a large empty table or blank wall one at a time, forming teams or clusters of notes. There might be notes that do not seem to fit in any of the existing clusters, often called 'lone wolves'. These should be left aside for later use. The next step is to name or title the clusters (Hanington, 2012; Mayhew, 1999). Cluster names and 'lone wolves' are read and grouped into more abstract groups that help to find general and overarching themes (Koskinen et al., 2011).

The affinity diagram helped us to categorise data and to find similar themes among the interviewees' statements, and helped us to identify the essential themes across the user's experiences, as well as it helped us to prevent selective interpretations of the statements (Kvale & Brinkmann, 2015a). We wrote down the statements elicited from the meaning condensation. Each statement was written on a separate sticky note. Afterwards we spread the sticky notes out on a table (See Figure 7) and read all of them several times in order to capture the experiences interviewees reported regarding Aula.

Figure 7: Sticky notes spread out on a table.

While reading the notes, we already noticed that some notes seemed to have a similar theme or that they could be grouped under the same category. From there we started to group the notes together forming clusters of notes (See Figure 8).

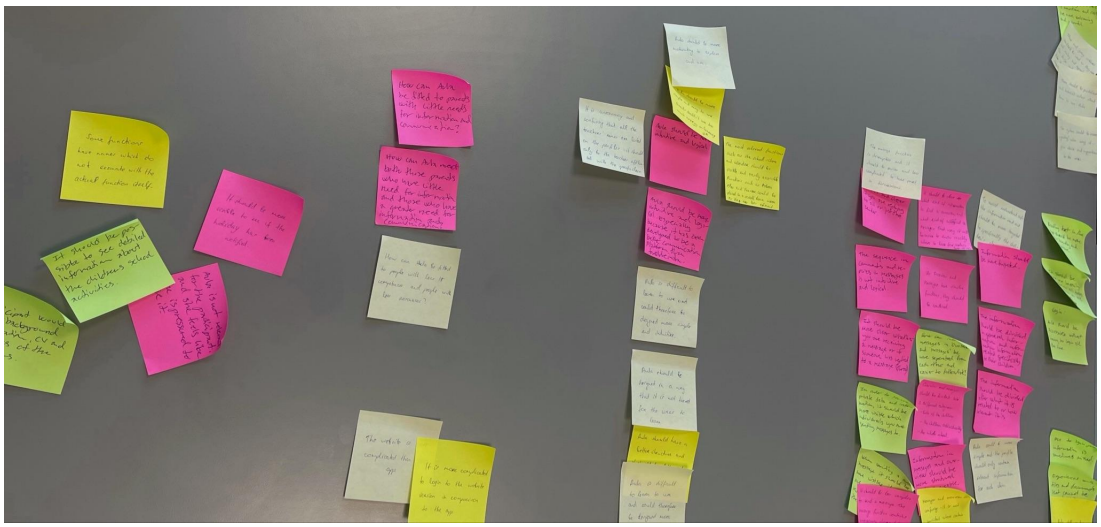

Figure 8: Grouping data and forming clusters.

When the notes were grouped into clusters, we named the clusters in order to find themes (See Figure 9).

Figure 9: Naming clusters and finding themes.

When all the clusters were named, we created a digital version of the affinity diagram (See Figure 10; Appendix 10 - Affinity diagram).

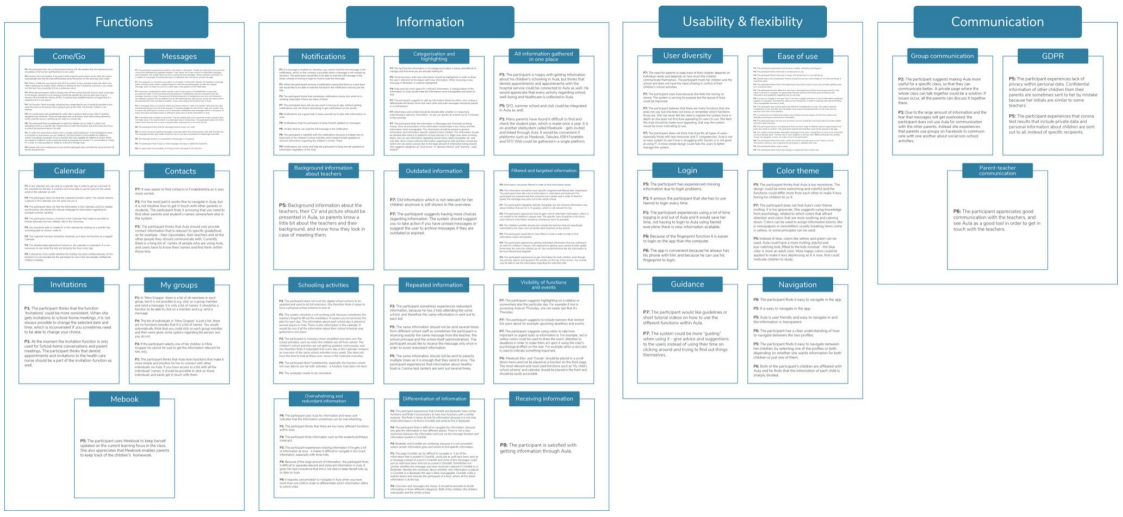

Figure 10: Affinity diagram. (See the online version here: Affinity diagram)

Overall we found four different themes within our data which are *functions*, *information, usability and flexibility* and *communication*.

Accordingly, the theme *Functions* refers to experiences parents have regarding specific functions within Aula. This theme consists of the following clusters: *Come/Go*, *Calendar, Contacts*, *My groups*, *Invitations, Messages*, and *Mebook.*

The theme *Information* refers to the parents' experiences regarding information exchange within Aula. This theme consists of the following clusters: *Notifications, Categorisation and highlighting, All information gathered in one place, Background information about teachers, Outdated information, Filtered and targeted information, Schooling activities, Repeated information, Visibility of functions and events, Overwhelming and redundant information, Differentiation of information,* and *Receiving information.*

The theme *Usability and flexibility* refers to different experiences parents have regarding usability and flexibility of Aula in regards to how easy it is to use Aula or how well it currently is fitted to diverse users. This theme consists of the following clusters: *User diversity, Ease of use*, *Login, Color theme, Guidance,* and *Navigation.*

The theme *Communication* refers to parents' experiences regarding communication between school and home within Aula. This theme consists of the following clusters: *Group communication*, *GDPR and Parent-teacher communication.*

After all the themes were named, we examined each theme in order to find the overall problems and to see if they could be related to the focus of our research area, which are later converted into user requirements.

4.3. Capturing user requirements

To capture user requirements is an important part of software engineering methodologies. Dix et al. (2004b) describes a stakeholder as *"anyone who is affected by the success or failure of the system"* (Dix et al., 2004b, p. 458). User and system requirements need to be captured and analyzed within the context of use as designing or redesigning a system can affect or change the current organizational and work practices (Dix et al., 2004b). Sometimes organizational issues affect the level of acceptance and relevance of an information and communication system. Such factors typically exist outside the system and can play an essential role when determining the success or failure of a system. If a system has more than one stakeholder group, their needs can be both complex and conflicting (Dix et al. 2004b). *"People in organizations and groups have conflicting goals, and systems that ignore this are likely to fail spectacularly"* (Dix et al., 2004b, p. 452).

User requirements within the thesis will be captured by analysing the qualitative data we have gathered within contextual inquiry and semi-structured interviews, and are defined within section 4.5. where we also explain each of them in detail.

4.4. Use case diagramming

Use cases can be used to capture how the user interacts with a system and to document system requirements. According to Whitten & Bentley (2007) "*Capturing and documenting system requirements have proved to be critical factors in the outcome of a successful information systems development project (Whitten & Bentley, 2007, p. 243).*"

When developing information systems, it is important to be able *"to elicit the correct and necessary system requirements from the stakeholders and specify them in a manner that is understandable to the stakeholders in order for those requirements to be verified and validated"* (Whitten & Bentley, 2007, p. 244). When focusing on the users of Aula, we aim to get an understanding of how the users actually use the system, instead of focusing on

how the system is constructed. We have chosen to use use case diagramming in order to describe the use of Aula and to help document requirements. Use case diagramming has proved to be a valuable tool in order to determine system requirements from the users' perspectives and to describe and document the usage of a system in more detail in order to capture potential problems within the system (Whitten & Bentley, 2007). Use case diagrams throughout the analysis help us to specify what and why the users of the system are trying to accomplish (Whitten & Bentley, 2007). In order to do this, actors are used as representatives of the actual users of the system. Actors represent the users who initiate the system activity that is required to complete a task, and they could be either *primary* or *secondary* actors. A primary actor represents the stakeholder who primarily will benefit from the use case scenario and secondary actors interact with the system, but they do not trigger the use case (Fantechi, Gnesi, Lami, & Maccari, 2003). Within this research, parents are identified as primary actors, whereas secondary actors are school, SFO and teachers.

4.4.1. Relationships

A relationship between an actor and a use case is called an *association*. A relation in a use case diagram is illustrated by a drawn line between two symbols:

- An arrow headed line pointing towards the use case indicates that the actor has initiated the use case.
- A straight line without an arrow head between a use case and an actor indicates an action between the use case and an external server or receiver actor.
- Any line between a use case and an actor means that the actor is communicating with the use case (Whitten & Bentley, 2007).

If a use case contains more complex steps, these can be extracted into their own use case. These use cases are called *extension use cases* and they extend the functionality of an original use case. The relationship that extends the use case is called an *extends relationship*, and it is represented as a dashed arrow headed line pointing towards the

original use case. *Include relationships* are relationships between use cases and abstract use cases. An abstract use case is used as a reference to a use case that needs its use. An abstract use case represents an automated action, and it is illustrated with a dashed line with an arrow headed pointing towards the abstract use case (Whitten & Bentley, 2007).

In order to create the use case diagrams, we have used the online diagramming tool Lucidchart (Lucidchart, n.d.). Use case diagrams are presented throughout the analysis in order to explain and visualise the steps that the users need to take in order to accomplish specific tasks in Aula.

4.5. Analysis

As Aula is a communication and collaboration platform (Aula, n.d.-d), the focus of this analysis concerns how Aula can be improved in order to better support the school-home communication and collaboration. We will therefore focus specifically on the collected data, which we have assessed has a greater significance on the school-home communication and collaboration. In addition, as our participants have many wishes and requirements for improvements, we have limited our focus to the problems which are best articulated and most well-documented. In order to support this decision we have used Aula's prioritization model (Aula, n.d.-b). According to the prioritization model, Messages, Come/Go and Calendar are the modules of the highest priority. In order to communicate and collaborate with the school, parents are using Messages and Come/Go functions on a daily basis. Messages are used to communicate with the school staff, while Come/Go is used to notify absence. The Calendar helps parents to keep themselves updated about their children's school schedule and other schooling activities. Based on the arguments above, we have limited the focus to these three modules.

Throughout the analysis our participants are referred to as P followed by a number, for example P1, P2, P3 and so on. The quotes we use from our data are referred to the participant (P1) and the specific question (Q7) that the quotes are taken from (P1, Q7).

All the interview transcriptions can be found in Appendix 8 - Interview transcripts.

4.5.1. Use of devices

Our participants at the beginning of the interview were asked whether they use Aula's app or Aula's website version. Besides that, they were asked to tell us whether they use a smartphone, a tablet or a computer, or maybe several different devices to log in to Aula.

Figure 11 below represents the distribution between the usage of the app version and the desktop version of Aula. As Figure 11 shows, almost everyone except one participant uses the app version of Aula, and one of the participants uses both the app and the website to log in to Aula.

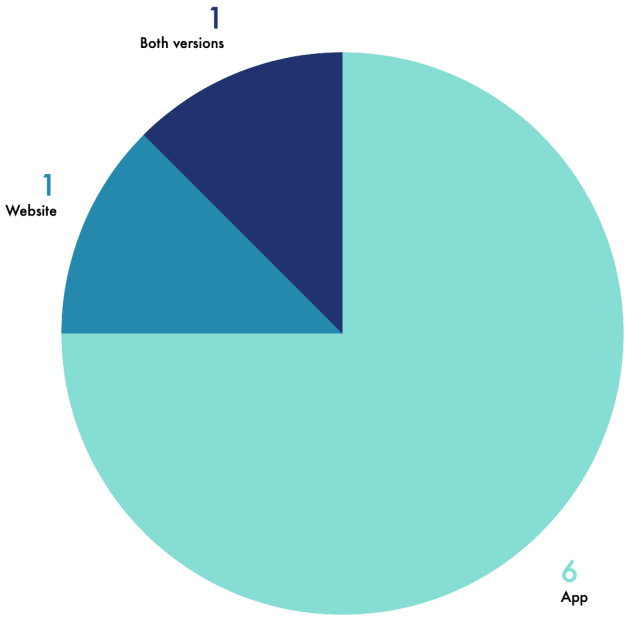

Figure 11: Distribution between the usage of the app and the website versions of Aula.

Furthermore, Figure 12 below shows that Aula is mainly accessed via smartphone. However, one participant only uses Aula's website version, while another one either uses a smartphone, a tablet or a computer to access Aula.

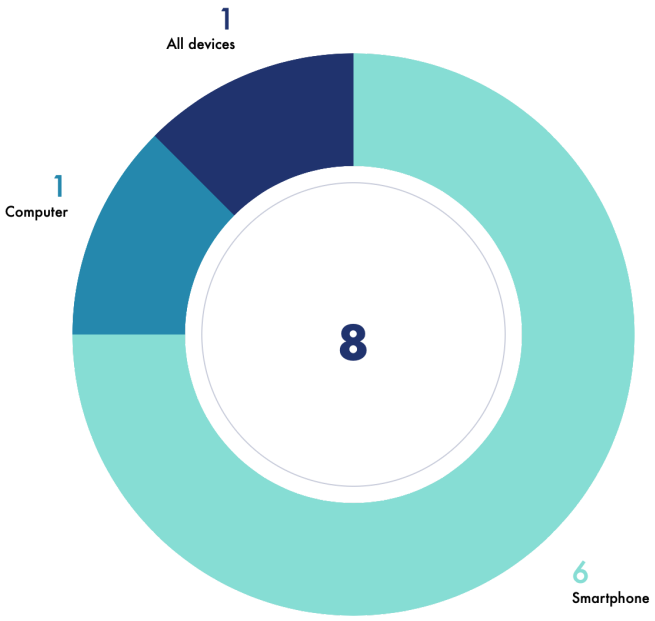

Figure 12: Devices used for Aula.

As our data show that most of the participants use their smartphones to access Aula, the analysis has therefore been limited to only concern the app version of Aula.

P6 states that he primarily uses his phone as notifications help him to keep himself updated *"(...) whenever I receive a new message, I get a pop-up message on my phone, so I am constantly on the line, so to speak." (P6, Q1.7.c.).* Due to his job at a mall he finds it convenient that he can keep himself updated at work. Notifications also make it possible to keep yourself updated regardless of a specific time. "*For example when the information arrives late at night, then I still have the possibility to read it and not miss it." (P5, Q14.2).*

P3 points out that he also finds it convenient to be able to reply to the teachers messages regardless where he is and that it would be more complicated for him to use Aula if he had to use the computer: *"I mostly use smartphone, because it is the one I have in my hand all the time, and then I receive the messages directly, and I have the option to reply. If it was on the computer, then yeah… Then I would have to come home in order to reply (...) I am very glad I have it on the phone."* (P3, QD)

P7, who only uses the computer in order to assess Aula, states that she finds notifications stressful, which is why she has not turned notifications on on her phone. She further explains that she does not see the point in having an app on her phone, without getting notifications. "*In my opinion there is no reason for having an app unless you have notifications on, which means your telephone is beeping constantly.*" (P7, QD)

Our data shows that getting notifications can both be a helpful tool, but it can also be stressful depending on personal preferences.

4.5.2. Parents' experience with Aula

Among our participants the experiences with Aula are very diverse. Some of the users find Aula frustrating to use, while other participants are very satisfied with the platform. Seven out of eight participants think that there is room for improvements within Aula, except P8, who think Aula is perfect.

The participants were asked to rate Aula on a scale from 1-10 (Q22). P6 left the interview due to personal issues after question 14.2b, which is why this participant did not have the chance to rate Aula and are therefore not represented below (Figure 13). Figure 13 below presents the participants ratings of Aula as well as an explanation of why they have given the specific rating (Q22.1).

Participant	Rating	Reason for the rating
P1	7	*"It could just be cool if things could be gathered even more (...)"*
P2	7	*"Because I think it could be simpler."*
P3	8,5	*"Nothing is perfect. But right now, for me Aula is… It is great and it is perfect, but it is not so perfect that they can get a 10."*
P4	3	*"Well, I get the information I need and I have the possibility to text the school and such, but it is just incredibly cumbersome."*
P5	8	*"Because there are things that need to be improved. I don't think that it should be necessary to shift between devices in order to access Aula. Or that you cannot open the file when using one type of device, but you can on another (...)."*
P7	6	*"Nothing special. It's like a student getting 4. It wasn't bad but…"*
P8	10	*"It is a very easy design, which I think works well." "Nothing lacks, hence the high score."*

Figure 13: The participants' ratings of Aula and reasons for the rating.

In order to get an understanding of how they use Aula, we asked the participants which functions they use the most in Aula (Q18) (See Figure 14). It was clear that Messages is the most used function among our participants.

P3 states that it is a quick way to communicate with the teachers and it is also convenient and easy to reply to the messages: *"It goes fast and we get answered" (P3, Q16.1.)*

P1	Messages, Overview, Invitations
P2	Messages, Gallery
P3	Messages, Calendar
P4	Messages, Come/Go
P5	Messages
P7	Messages
P8	Messages, Calendar, Invitations

Figure 14: The most used functions in Aula among our participants.

4.5.2.1. User Diversity

Our data shows that our participants are very diverse regarding both the use of Aula but also regarding the need for information. Some of the participants have a great need for detailed information about their children's schooling activities, whereas other participants have little need for information. P5 has children at two different schools and she expresses a need to get to know the teachers as it can increase and improve communication. She states: *"All conflicts, or if there have been a good or a bad day - I always get updated through Aula. I feel that we have "close contact" through Aula. But it's not the same with my daughter's school. It is difficult to get close to them, because we do not know the teachers." (P5, Q2.1).* P5 also mentioned that there was a function in the former platform Forældreintra where she was able to see what her children were doing and where they were located regarding schooling activities. She would like such a function in Aula as well, as she states: "*In general I do not like that you in Aula are not able to see where the children are. It's because, in Forældreintra, there was a function where for that where the children had to login and then you could see where they were. For example, could I see that my son has arrived at school, and then I could see that they are out for sports activities." (P5, Q7).* P4 on the other hand states that she does not have the time to keep herself updated on Aula all the time and that she would rather do

something else. She points out later on that her daughter just as well can tell her some of the news posted in Aula. *"I don't have time to sit and look at it. Well, I really don't have any. I would rather do something else (...)"* (P4, Q13.a.)

In order to find out more about the parents' involvement in their childrens' schooling, we have asked our participants about their responsibilities regarding Aula (Q3). For example, P3 stated that both he and his wife are responsible, but that he primarily is responsible for the administrative tasks whereas his wife is responsible for the practical tasks, such as preparing food. *"I am mostly responsible for the administrative things, and my wife is responsible for the practical, but sometimes she also responds, if I for example do not have time to do it. She does. And the same with me. If it is not possible for her to do the practical stuff, then I will do it."* (P3, Q3). Although he and his wife are responsible for most parts regarding Aula, their children use Aula themselves in order to check up on their homework (P3, Q3.1). This was the case for several families we interviewed, however, there were also families that do not share responsibility regarding Aula among their family, but where our participants were fully responsible for Aula. Based on the data, some of the older children check Aula themselves in order to check their homework or schedule, but overall the parents are the ones who take the responsibility for Aula. P6 states: *"Hm, yes, they read the messages themselves, but hm… I want to say, it's probably a little too much to say that they themselves are responsible for something in Aula. We go in and out all the time, and check in as parents. We simply have to. (..) Well, it's like that because, well otherwise we can not really count on it being checked or that it is in order. Uh, so yes .. But yes."* (P6, Q3.1. & Q3.1.a). P2 has the primary responsibility for Aula in his family. His daughter, who is in 7th grade, checks Aula regarding homework and sometimes she communicates with the teachers as well. His wife sometimes checks pictures and reports from the children's school days, but he is responsible for the communication. *"So it is primarily what happens in the school. All these letters. Checking up on appointments… Especially in this Corona-situation, where you often have to be aware."* (P2, Q3.2)

P1 usually uses the Message function in Aula to communicate with the school, and everything regarding communication and collaboration takes place in Aula. Overall she

is very satisfied with the collaboration with the school. She checks Aula whenever she gets a notification and assesses the information she finds relevant: *"I just login whenever I receive something I feel like reading. I do not login every time I receive a notification. For example, when I receive Corona news, then I don't read it."* (P1, Q10). Another factor that determines the need for parental involvement is how communicative the children are. *"(...) well, I do not need to know exactly how they have divided the playground, Clara can tell me that as well."* (P4, Q13.a). P7 has similar experiences and she states that she thinks of several factors that come into play regarding parents' need for information: *"(...) first thing of course this is particularly parents personality, how controlling parent one is, I'm not the one. Another aspect is how much kids are telling, how good communicators kids are."* (P7, Q10). She states that her own children are good at communicating and she therefore does not have a great need to get information through Aula: *"(...) generally our kids are quite good communicators and they come an say, and tell stories and they tell okay what's happening, what's new and so on (...)"* (P7, Q9).

Summary

The need for information among parents is diverse and depends among other things, on how good at communicating the children are. This factor plays a significant role, as the parents with children who communicate a lot about their schooling activities, do not feel a great need to assess Aula in order to find that information. Because of their communicative children, these parents therefore find a large amount of the information provided in Aula irrelevant.

4.5.2.2. School-home communication and collaboration

When asking the participants about their collaboration with the children's school (Q4), P3 answers that he communicates a lot with the teachers and that he thinks the collaboration with the school works great. He explains that he tells the teachers that *"If you want some good students, then you have to inform us about everything that is going on." (P3, Q4).* He appreciates that the teachers communicate about the students'

activities, as it helps him to help his children to behave properly or to do their homework. *"When there is something you can do for the children. If they for example do not do their homework, or if they behave badly at school… Yeah… then we communicate a lot about it..." (P3, Q4).* He and his family primarily use the Message function in Aula to communicate with the school and only call the school whenever there is a serious problem or something urgent to discuss (P3, Q5).

P2 explains that they have been unsatisfied with the collaboration at his daughter's school, due to issues regarding the social environment in her class. The teachers have been helpful and did their best to help, which he appreciates. Due to the Corona-situation the children have had online teaching, and he believes that the online teaching and increased online activities, have strengthened the relationships and social environment among the students. *"We have talked about things. It has had a little effect. Eve is way more happy at school now than earlier. Maybe it is… I do not know. Maybe Corona has helped a little."* (P2, Q2.1.b). Overall he is satisfied with the collaboration with his children's school. The school staff is good at helping when problems occur and he experiences that everyone is welcomed (P2, Q7).

P4 mentions that her and her family overall are satisfied with the school. As parents they do not demand or expect much from the school, but would like the children to be more active at school instead of watching too many movies in the classroom. 7 out of 8 participants expressed that they were overall satisfied with the collaboration with their children's schools and that they appreciated the school staff as they appear welcoming, friendly and good at communicating as well as taking care of problems at school. P5 has two children attending two different schools and states that she is happy with the collaboration with one of the schools, but the collaboration with the other school could need some improvement. She would like the teachers to communicate more and be more involved in problem solving, regarding problems that occur at school. *"All conflicts, or if there has been a good or a bad day - I always get informed via Aula. I feel that we have "close contact" through Aula. But it is not the same with my daughter's school. It is difficult to get in touch with them because we do not know the teachers."* (P5, Q2.1). That

the teachers communicate frequently with the parents and reach out when they discover problems among the children in the schools are two factors that are crucial for the satisfaction with the school-home collaboration.

Summary

The factor that determines good school-home collaboration is that the school staff are welcoming and friendly and communicates frequently and reaches out quickly if problems arrive at school. All the parents appreciate that the teachers show interest in their children's well-being in school and that they do their best to solve any problems that occur.

4.5.2.3. Overwhelming amount of information

The participants state that the amount of information in Aula can be overwhelming and that it can be difficult to navigate within the large amount of information with more than one child. Sometimes P3 misses out on information if he receives more information at the same time. *"(...) when we get a lot of information at once. Then it is a little difficult to keep track. Okay, what is it I need to keep up with here? And that is where you sometimes, it is too much. Especially with three childrens and three profiles…"* (P3, Q6). P3 has two children attending the same school and he thinks that the large amount of information among other things are due to the fact that the same information is sent to each child, and therefore he often receives the same information twice. *"For example if they [the school] have announced that they are going to open, and I have two children attending the same school and then they send out the information to one child and then also to the other one, despite the children having the same parents. So it's almost like I get the same messages twice. At that point, it is a bit too much for me" (P3, Q7).* P6 also indicates that it can be difficult to navigate all the information in Aula. He has two children and he overall thinks it is convenient to be able to shift between his children's profiles *"You have to figure out how to navigate between them and be familiar with who is who (...) but it is sort of quite sharply divided" (P6, Q1.6).* When asked afterwards whether he finds it easy to navigate between the children's profiles, P6 answers that he is satisfied with the

function and that he does not see it as a problem to navigate between the profiles (P6, Q1.7.c.). Overall, P6 is very satisfied with Aula and finds Aula relatively easy to use, but the large amount of information sometimes makes it difficult to get an overview: *"Well, my overall experience is that it is fairly structured, reasonably well set up. It is relatively easy to use… and… yeah then of course there is a lot of information and then you have to concentrate…" (P6, Q8).* When asking P4 how she experiences getting information in Aula, she answers that the amount of information is large and that it can be difficult to dissect what information is relevant and what is not. *"(...) We probably both feel that we get a lot of information and we feel that it can be difficult to dissect what is actually relevant." (P4, Q13).* Another thing that parents mention is: *"It may also be that one gets a bad conscience, that you should pay a little more attention to what is happening on behalf of my children… I just sometimes find that the information is unimportant" (P4, Q13).* P4 mentions birthdays listed in the Calendar as an example of unimportant information. Several participants experience receiving the same information multiple times, either due to the fact that they have two or more children attending the same school or that the information is sent out from different school staff. *"I have many times received a message from the teacher, and afterwards from the school principal and sometimes one more time from the school who sends out the exact same information, and then I get the same information 3 times, just from different senders. Maybe it is possible to just send it once, instead of 3?"* (P5, Q8).

Another problem regarding information in Aula is the data security. P5 does not feel that the level of security is high enough as she receives messages with private information about other children that she should not be able to receive. *"They do not think so much about data security. For example are all Corona test results just sent out to all from the parents, and everyone can see data regarding the children. That is not very good. Sometimes I even receive private messages, which were intended for the teacher."* (P5, Q17).

Because of the confusion with the large amount of redundant messages, P1 explains that she communicates with other parents via Facebook groups, because it is more convenient and faster to communicate via Facebook. She also indicates that Aula could

have a function similar to the Facebook groups, where the parents in each class can communicate with each other as a group. *"There are many classes that have their own Facebook groups and so on. And then that is where they communicate with the parents. Then it also goes faster. You can probably make an arrangement inside Aula where you send out to the parents in this class and so on. I don't really know why, but there you have mostly Facebook Groups. There you have the communication between the parents, where Aula is more for pure school use only. (P1, Q9)*

Summary

The feature where parents are able to add or deselect their children's profiles in the top menu works well, but the amount of information in Aula can be overwhelming, especially with two or more children at the same school, which often causes the participants to receive the same information multiple times. The overwhelming amount of information makes it difficult to dissect what information is relevant and which is not.

4.5.2.4. Distinguishing between Messages and Overview

In terms of distinguishing between information, both P1 and P4 mention that the information that is provided in Messages and Overview often are similar. It is not consistent where certain information goes and it makes it difficult to navigate and distinguish the information. *"(...) It is confusing that there is both this Overview and this Messages, it could somehow just be combined." (P4, Q21).* P1 also mentions that when she receives an email notification saying there is a new message in Aula, she does not always know if the message is posted in Overview or if it is in Messages. *"Sometimes it can be difficult to figure out if the message you have received is placed in Overview or in Messages, because it is like… Sometimes it is unclear what is going on, where is it placed?" (P1, Q1.7.a.).* Several participants think that Aula is messy due to the large amount of information sent out in Messages and Overview. They do therefore not know where to look for certain information. The fact that information is not categorised or sorted can

make it difficult to know where to find it. P7 points out that because the information is not categorised, sometimes it is necessary to scroll far down in Overview in order to find the information she is looking for. *"(...) and now I think of okay was holidays approaching and so on I would think yeah I would do more bonding with my kids and what are trends and what are tendencies and what school psychologist is suggesting and then I have time to get more deep down into detail, but if that information is somewhere long way down and it is not categorized…"* (P7, Q19).

Summary

Several parents cannot see the difference in the information provided in Messages and Overview and in combination with the large amount of information it can be difficult to navigate the information in Aula, knowing where to look for certain information as well as distinguishing between relevant and non relevant information.

In the following analysis sections we will go in depth with the functions Messages, Come/Go and Calendar, in order to capture the user requirements. The elicited user requirements (UR) are listed at the end of each section. We have used the abbreviation UR followed by a number, which refer to the specific user requirement, for example UR1, UR2, UR3 and so on.

4.5.3. Messages

Messages are the most used functions among our participants as it is the primary source for school-home communication and if the participants need to discuss something more urgent with the school, they typically call them instead of texting. *"I use Aula and the Message function in there, if anything occurs. I think we called together with a teacher once, when something needs to be scheduled, but otherwise everything takes place in Aula. It is also where the teachers communicate, if something comes up."* (P1, Q5)

However, there are also issues regarding the Message function. P7 experiences for instance that the sequence in messages and replies is illogical which can make it difficult to navigate in messages: *"It is not like when I'm used to let's say Microsoft Outlook for example there comes an update there is a logical sequence, but here everything goes up after the original message, even if a reply has come on a later date, it still appears on the initial date."* (P7, Q8)

Another issue that makes it difficult to dissect in the messages is that people by mistake reply to all recipients when the intention was to reply to the sender only. That users sometimes forget to click on 'Reply sender directly' (See Figure 15), causes the participants to receive a large amount of redundant notifications and new messages. *"There is something in Messages. If someone sends out an all-message, then people are generally bad at clicking "reply only sender", so you often get notifications, like 50 notifications, because someone has sent out an all-mail. Everyone responds back. Notifications just keep coming… And it is a little annoying. It is a little one down at the bottom where one can choose to reply all or to reply to the sender directly. People forget it." (P1, Q9)*

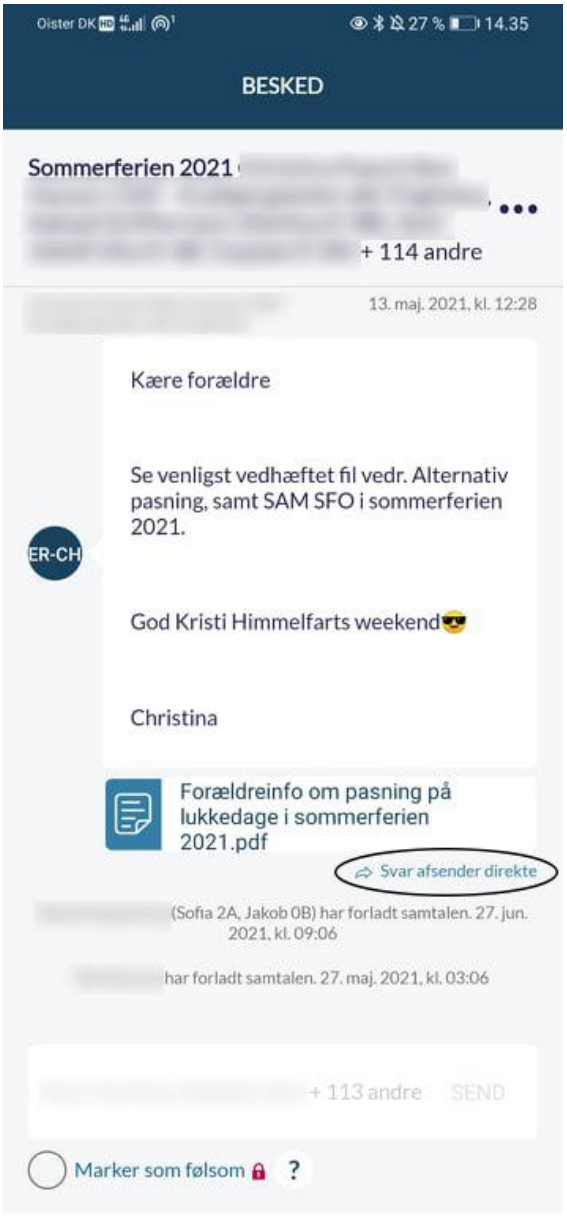

Figure 15: The area marked with a black oval shows the button 'Reply sender directly' (Svar afsender direkte).

When the user clicks on 'Reply sender directly' a new page opens, from where the user is allowed to reply to the sender (See Figure 16).

Figure 16: The page that opens when the user clicks on 'Reply sender directly'.

The use case below (See Figure 17) visualises and describes the steps it takes for the user to either reply to all or to reply to the sender directly. 'Reply to all recipients' is included in the base use case: 'Reply to a message', as it is an automated action when the user enters the writing area below the message-page. 'Reply only sender' is placed as an extended use case, as it requires the users to take action and actively choose to click on 'Reply sender directly'. It therefore requires an extra step compared to when the user wishes to reply to all recipients of a message, which they can do by typing in the text area at the bottom of the screen (See Figure 18).

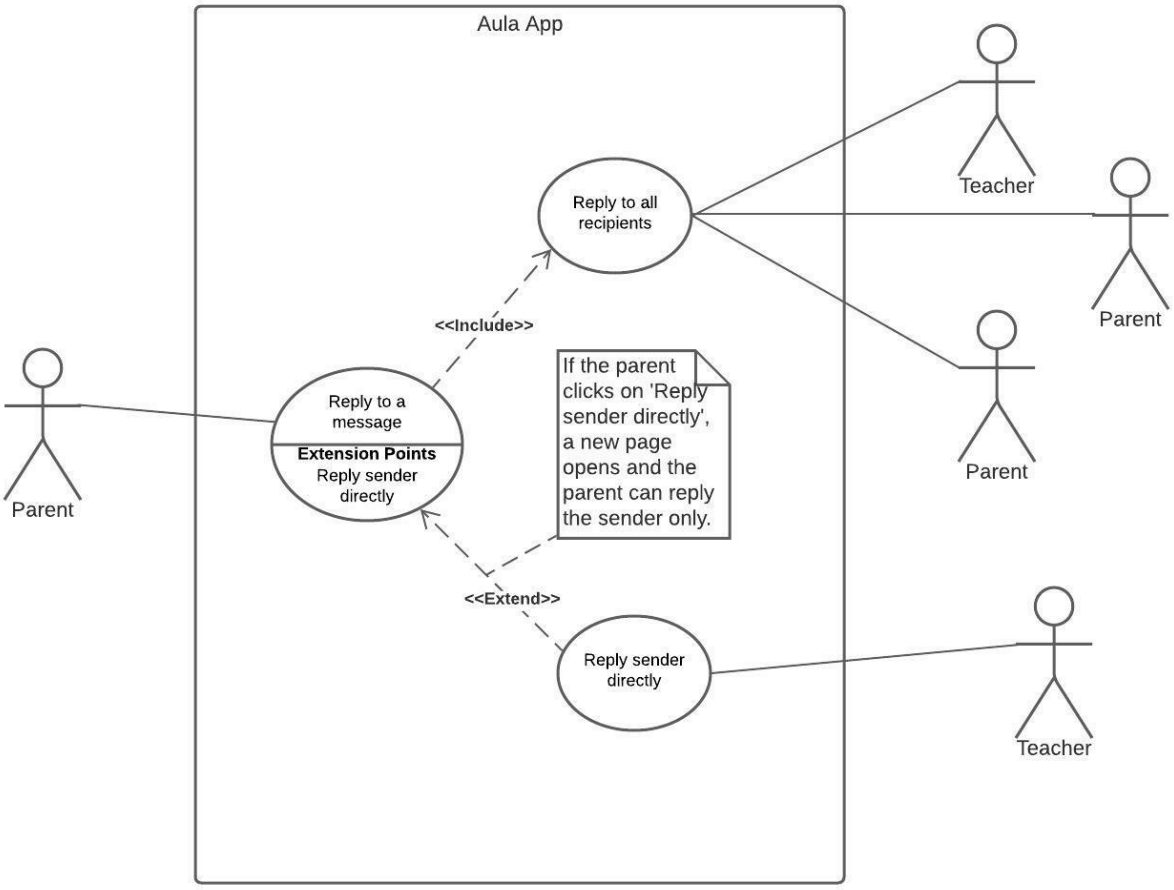

Figure 17: The use case diagram shows the steps the user takes when replying to all recipients or to the sender directly.

Figure 18: The black arrow pointing towards the writing area, where the user can type in order to answer all recipients.

When parents mistakenly answer all recipients instead of the sender directly, it makes it difficult and confusing to manage the messages. *"When they send out all-mails, it becomes a little difficult to keep track of. Therefore, I do not use it to communicate with the other parents. In fact, I do not think I am the only one who feels that way." (P1, Q4)* Instead P1 uses Facebook groups to communicate with the other parents, as it is faster and easier.

P7 states that it makes it complicated to keep track of messages when everyone replies to everyone in group messages. "*For example here there is a message which is sent, a group message, and that we see everything.... all replies to whom and, because how it's build up it is quite complicated (...)" (P7, Q8)*

That other parents reply to all can cause the users to have a large amount of unanswered messages in the inbox, because it is difficult to keep track of all the replies in Messages. *"Somehow I'm getting involved because when the replies come it gets here in this column of my messages. And it only gets that I have a bunch of unanswered messages - unreacted messages but those are actually comments." (P7, Q8)*

The participants sometimes receive notifications saying that there is a new message, when someone has replied to an original message. Aula does not sort in new messages or replies to messages, which result in parents receiving a large amount of notifications. *"The only time it is annoying is when I receive all these all-mails and all the parents cannot figure out how to… Well, everyone answers everyone. I have tried that a few times, where the messages just keep coming."* (P1, Q14). Figure 19 below shows that a user has a large amount of unanswered messages.

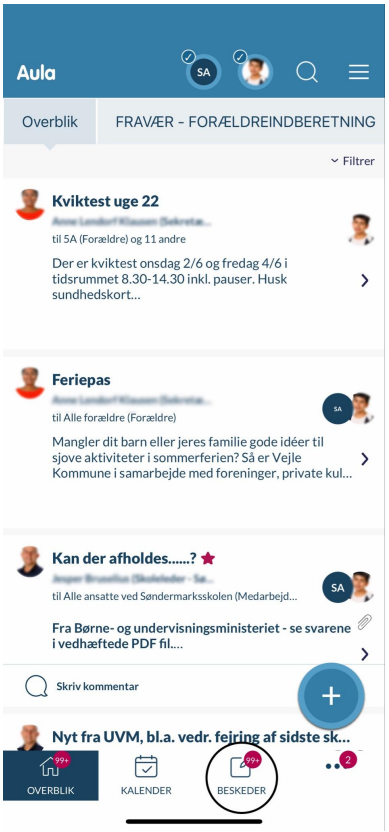

Figure 19: The red dot marked with 99 in the Message icon shows that a user has 99 unanswered messages.

Another issue in the Message function is that when sending messages, the users have to 'Save' the chosen participant before being allowed to send a message (See Figure 20) and P4 finds the 'Save' function redundant in the process.

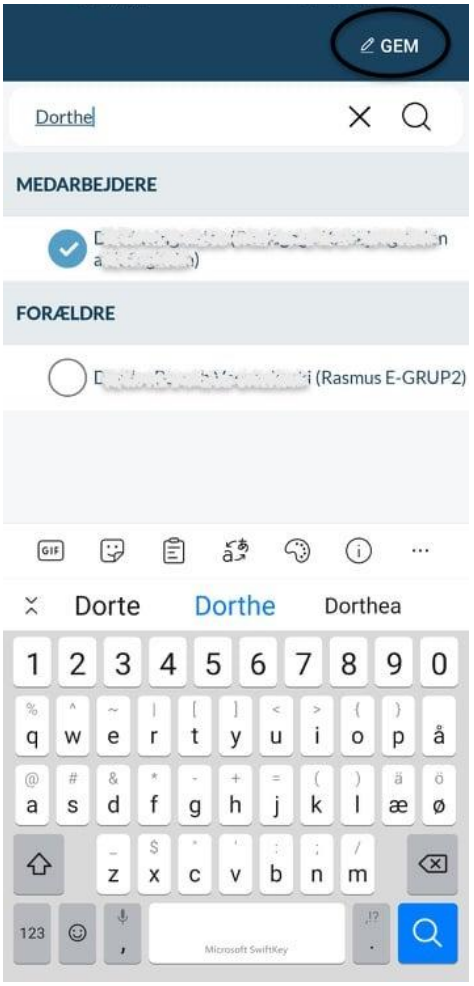

Figure 20: A recipient for a message have been selected and the user now have to click on 'Gem' (Save) in order to move to the next step.

P4 finds it strange and redundant that she has to save the selected recipient, as the recipient is not saved for good, but is just placed as a recipient in the draft (See Figure 21). That it is called Save does not match the actual action of the function. *"But then you have to, so just to write a message here, then you have to write Dorthe, um for example for Sigurds class leader (...) Then you click her forward, now I have found her here, right. Then go to the right corner and press 'Save'. It is not enough just to press, to tick her off there.*

You also have to save her and to save is a mess. Saving is not the same as putting her in … in a normal mail you just say "well she is found and now I write. … But you have to save her and it is a bit strange (...) She has just been placed in my message, so it is not because she is stored like forever and always, so I can easily find her again another time I have to write a message. She is just saved so I can write my message to her." (P4, Q9)

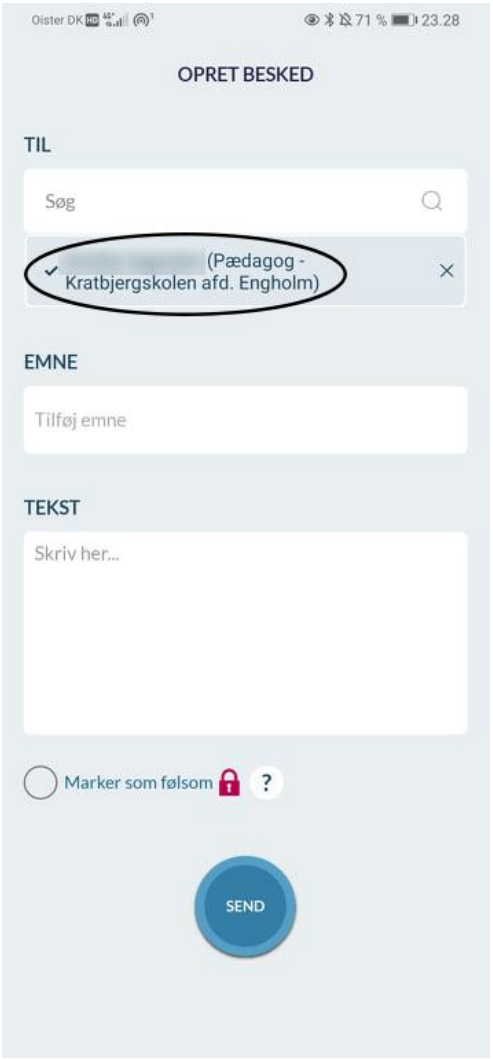

Figure 21: The recipient is now saved and is as a result shown under the search area. The user can add more recipients by typing in the search area again.

P4 points out that it is misleading to have to 'Save' the selected recipient as the selected recipient is not saved anywhere else in the system and the user would have to save the same recipient everytime they want to send this person a new message. *"So, it is very strange and double, as opposed to when we commonly write an email in Gmail or in outlook or something like that, and then you just found her, but to save her it is kind of weird is it not? Because it is not because she is hidden in my contacts. So it is insanely cumbersome." (P4, Q9)*

Based on the data presented above, we have elicited the following user requirements regarding Messages:

UR1: It should be avoided that users by mistake reply to all recipients of a message, when the intention was to reply to the sender only.

UR2: The message function should contain fewer clicks, when sending a new message.

UR2a: The user should not be asked to save the chosen recipient, in order to be allowed to send a message.

UR3: The sequence in comments and replies should be more logical and intuitive.

4.5.4. Come/Go

Come/Go is a module and function in Aula, where the users notify their children's absence. Our data shows that the experiences with Come/Go (See Figures 22, 23, 24, 25 and 26) are very diverse among the participants. Some of the participants never use the function while other participants find the function complex and not intuitive to use (P4, P5, P8). Some participants experience that there are too many clicks when performing tasks in Come/Go and that it is complicated to 'Notify Absence' in Come/Go. P4 does not

think that the name Come/Go fits the actual function, which is confusing because the name is misleading in relation to the actions she wants to perform.

(...) that it was not so cumbersome to use something called a Come/Go function, it is so totally insane - a word that no one would have thought of, so 'Come/Go it must be something like what times do I come and what time do I come home'. (P4, Q16.b.)

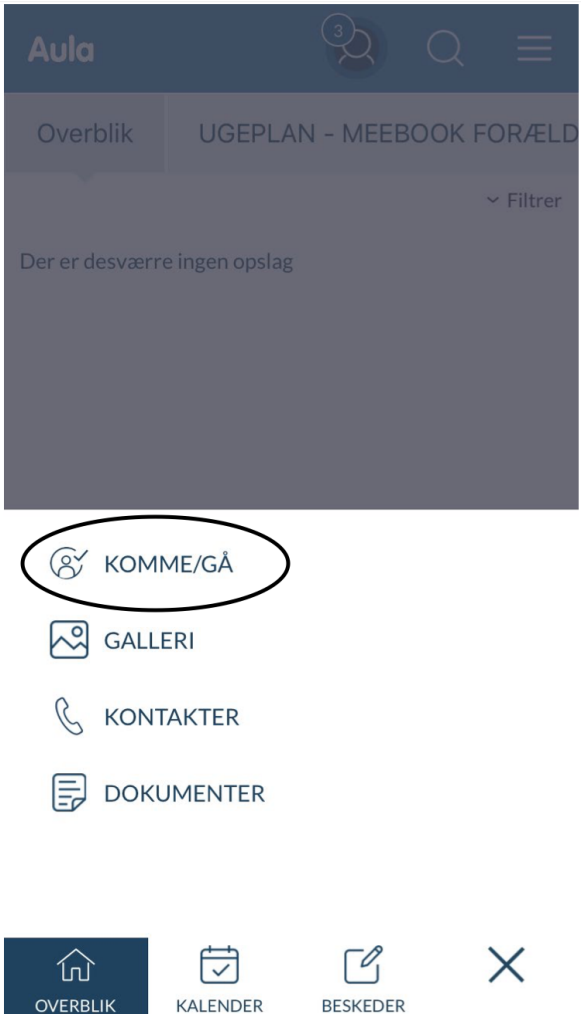

Figure 22: Placement of Come/Go function in Aula.

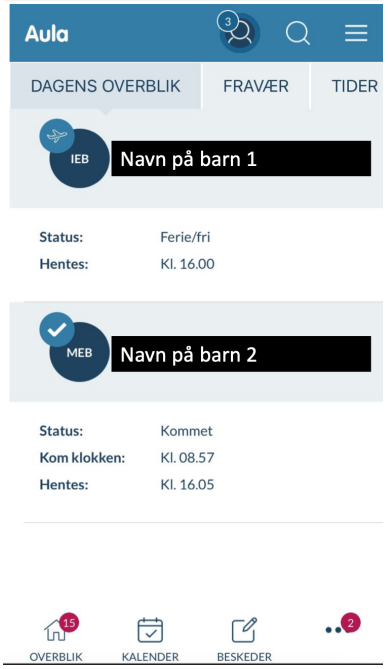

Figure 23: The front page - Overview of the day (Dagens overblik) in the Come/Go function. Child 1 is on holiday and Child 2 has arrived at the after school center.

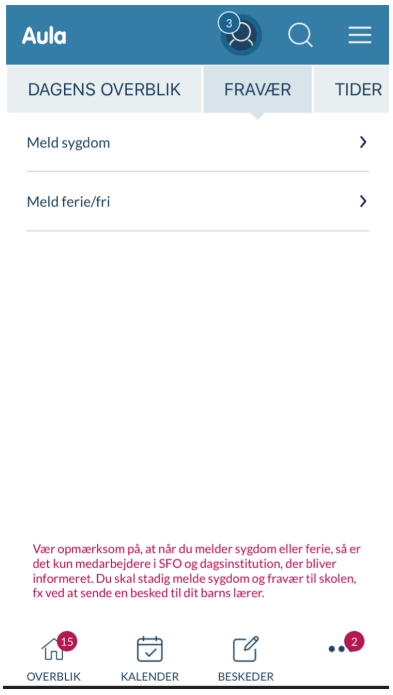

Figure 24: When choosing Absence (Fravær) in the top menu within Come/Go, the user can choose either to notify sickness or to notify Holiday/Off (Ferie/Fri).

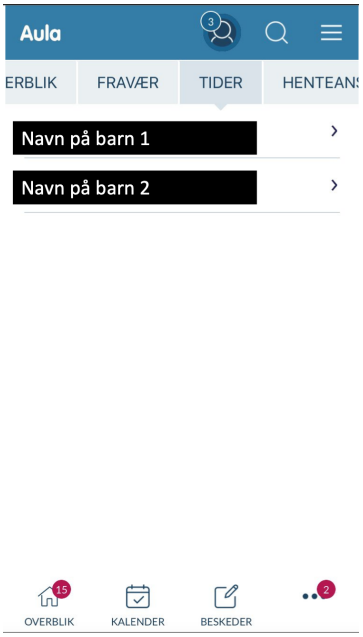

Figure 25: Choosing Times (Tider) in the top menu in Come/Go - the user can see the notified times and absence for one child at a time.

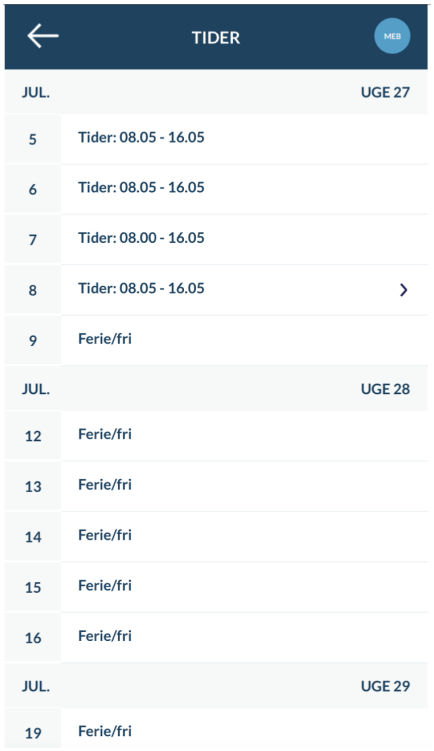

Figure 26: Times (Tider) shows the absence and holidays that are notified.

Another issue with Come/Go is that P4 finds it complex to notify who is going to pick up her children. The function 'Free Text' where the user is allowed to write the name of the person who is going to pick up her children, is not intuitive. *"Otherwise I can try to write Gudrun, I have never written Gudrun before. Then I have written Gudrun and then I just try to press 'free text' (...) yes, so something comes up where it says 'free text' and then I have to press on that one. Then it deletes that I just wrote Gudrun, but if I do not press anything, then I am allowed to write 'will be picked up by Gudrun' and now it is Gudrun who will pick up every Tuesday from now on." (P4, Q18.a.)*

She also experiences that the system automatically assumes that it will be a continuous event that the person you have typed in as 'pick-up responsible' will pick up your child on the selected day every week, which is a problem, as the user does not necessarily want it to be a continuous event (See Figure 27 and 28).

Figure 27: Continue Weekly is ticked off (Gentag ugentligt).

P4 tries different possibilities in order to notify who is going to pick up her children. When the feature is called 'Free text' you would intuitively think that you would be allowed to write anything you want, as the name of the function indicates. *"(...) so, now I have written Dad, further down it said that I could click on 'Dad', and then something strange comes up. Then it says: You have to choose who will pick up Sigurd (…) Well, It already says Niels (...) in the field. And then I went down here because I thought, well then I have to get out of there somehow… No! you cannot. Yes, and then I am allowed to press 'save' anyway even if it was in red. Is it not (…) Well then, that is what makes you get so tired of it." (P4, Q18.a.)*

While P4 finds the function complex, P5 never uses it because the information is not being updated by the school and the participant cannot see the point in using a function that is not being updated by the school staff. *"Come/Go - the function which contains information about when children arrive and go home. I do not use it, because even though my daughter is in school, it says my child is at home, which is not true. I do not see the point in using something that is not used by the school." (P5, Q19)* (See Figure 28).

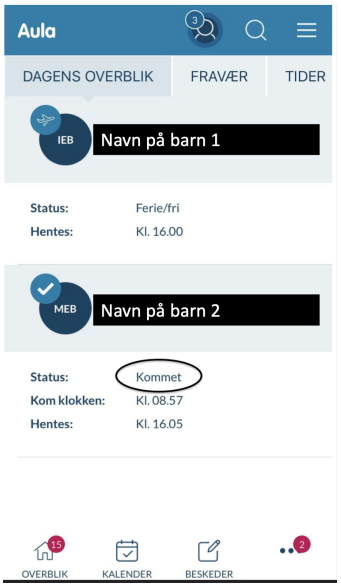

Figure 28: Showing that the child has arrived at the after school center or the daycare.

When notifying absence to the school, the participants have to text the teachers. P4 would like it to be more convenient to 'Notify Absence' and misses a function that makes the task easier to perform. *"Because to 'notify absence' in Aula it is only used for the After school centre level. So if the children do not come to school, then you have to text the teacher directly, via Aula, and it is a bit ridiculous, because how do you just (...) again if you do not concentrate, how would you know that when you have just 'notified absence' in this smart app, which the school uses and sends me a message, sends messages from, then I 'notify absence', Why is it then only for after school centres? Well, it does not make sense." (P4, Q4)*

When entering Absence in Come/Go, the user will get a reminder saying that if they notify sickness or holiday in Come/Go, only the staff in the daycare and after school centers will be the ones who gets notified. If they want to notify the school about a holiday or sickness, they have to text the school manually (See Figure 29).

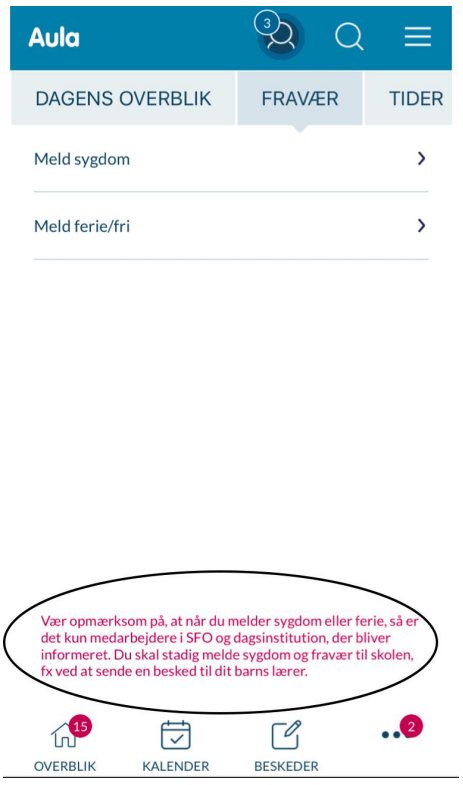

Figure 29: A reminder in Come/Go saying that it is only the after school center or daycare that receives information about absence notified via Come/Go.

The use case below (Figure 30) shows the steps the parents have to take in Aula, in order to notify absence both to the after school center and to the school.

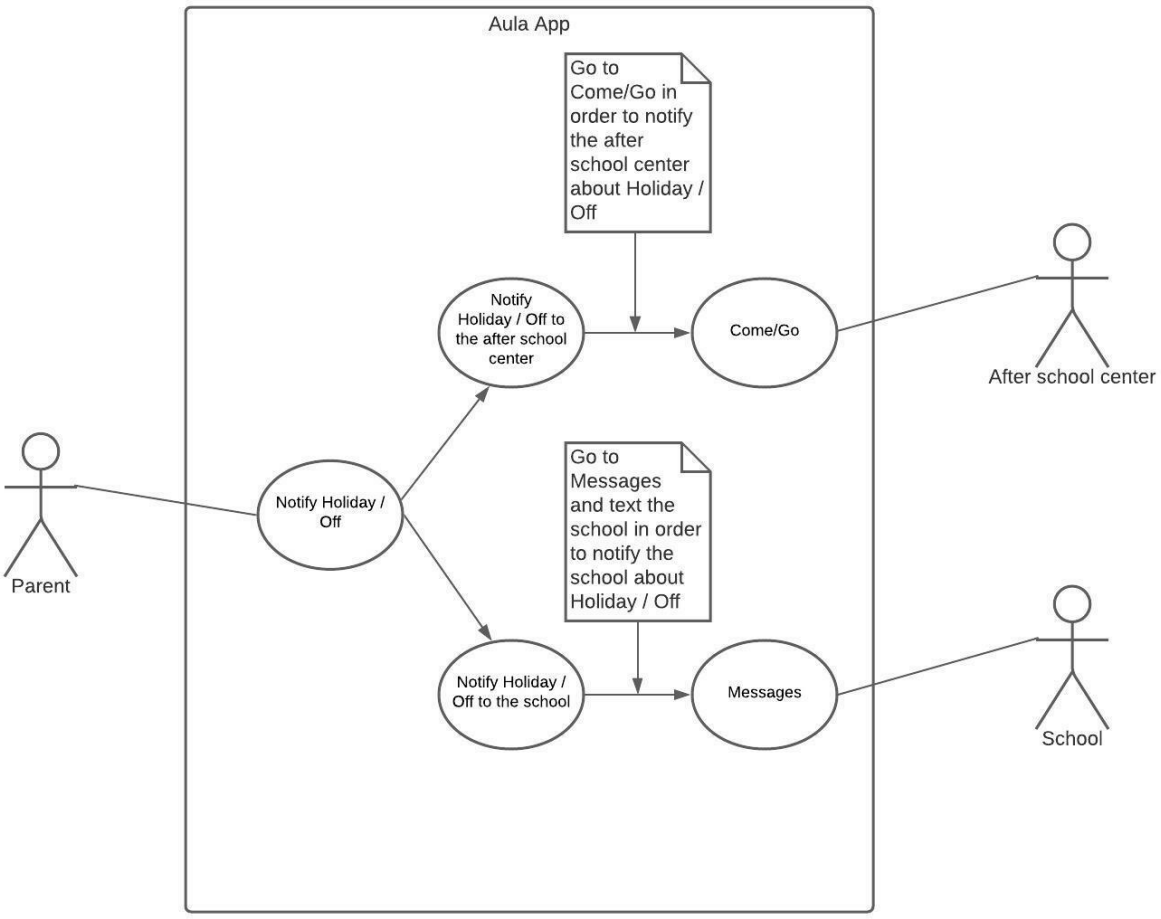

Figure 30: The user has to go to two different functions in Aula, in order to notify both the after school center and the school about absence.

Come/Go contains too many clicks in order to notify absence and it is not logical that the users have to notify the children's absence to the after school centers in Come/Go and that they have to text the school in order to notify the School about absence.

Based on the participants' experiences with Come/Go, we have elicited the following user requirements:

UR4: The user should be able to ‘Notify Absence’ once instead of twice. The user should not have to both text the teacher and mark the child ‘as fri’ in Come/Go.

> UR4a: The user should be able to ‘Notify Absence’ in Aula without having to text the teacher.

UR5: When the users type in who is going to pick up their child on a specific day, the system should not automatically assume that it will be a weekly event. The box should not be ticked off beforehand, instead the users should tick it off actively if they want it to be a weekly event.

UR6: The function ‘Free Text’ should be more intuitive and it should be easier for the user to notify who will pick up their child.

4.5.5. Calendar

Our data show that several participants (P1, P4, P6) experience issues with the Calendar function (See Figure 31 and 32). The participants for instance find some of the information provided in the Calendar is useless, that the function is missing options, and that it lacks information. P1 and P6 point out that the Calendar is not always updated and filled out with the up to date schooling activities: *“Under normal circumstances, that weekly schedule is such a bit… It is not always that the teachers have filled in what is going to happen this week and so on. For example, you can see that he who is in second grade, they go to school now, there you can see that it is only Thursday that is filled out, and the other 4 days are not. So there are some who do not bother to fill it out.” (P1, Q18.a.)*

P4 also states that she does not trust the information in the calendar due to the fact that she does not believe the function is being used properly: *“Well, of course changes can occur, but I just feel like… I believe that, not even that there, well I think that I probably have so little faith in the fact that it is used properly (...)”* (P4, Q1.7.e.)

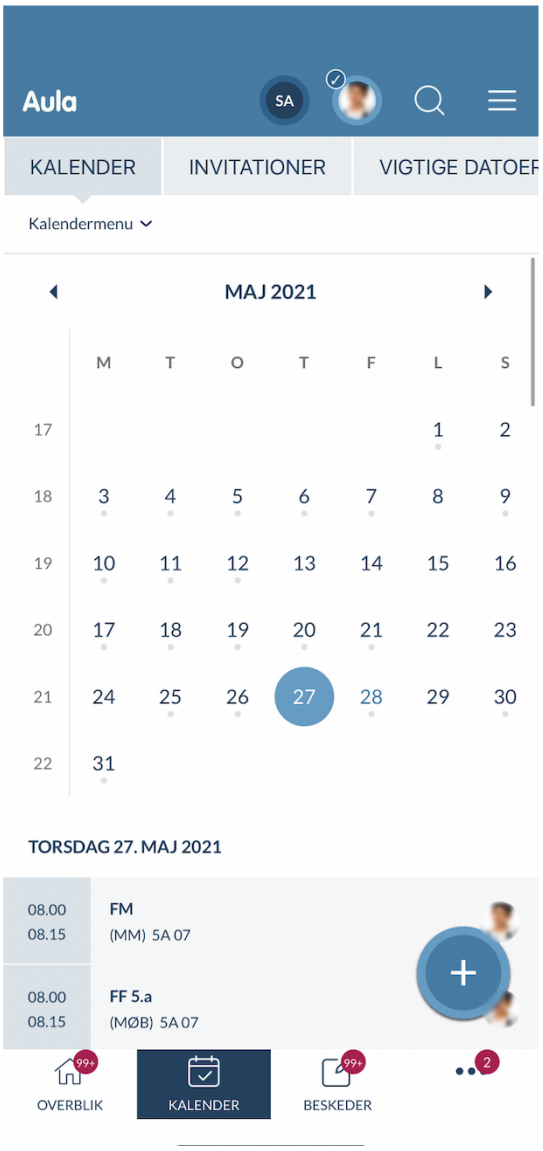

Figure 31: The Calendar.

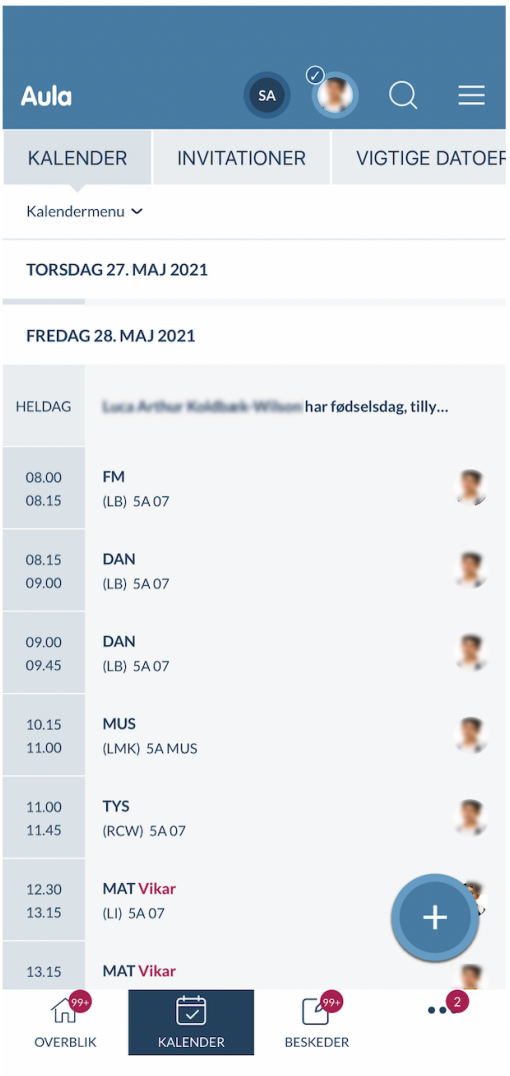

Figure 32: The daily schedule/scheme shown in the Calendar.

P1 finds it confusing that the schooling activities are placed in several places in Aula, but in different formats. She thinks it would be more manageable if the school scheme activities were gathered in one place in Aula instead of several places. *"It is like, what to say, more divided, in like different times and so on, but it does not say what they do. So there is a difference in the Week Plan, where it says what they do, and here in the Calendar it says which subjects and when. So it is really one thing, that it is kind of scattered around a bit. It would be nice if everything was gathered in one place and that it is decided what to do with that Week Plan." (P1, Q18.a.)*

Another problem the participants experience is that due to lack of updates, it can be difficult to rely on the information provided in the Calendar. Sometimes the participants are forced to look for information about schooling activities both in the Calendar and in the weekplan, which can be both confusing and time consuming. *"Do you use it or not? [the Calendar] And maybe you can just put the schedule in there too, because sometimes you need to find out when they have swimming, and then you have to go into the Weekly schedule, and then, "oh no it is not there", and plus you are missing that weekly schedule, because it is only from day to day. And when you go to the Calendar, and choose a day and then you can see the schedule for the day. And it would be nice if it was possible to see the weekly schedule. It is messy there at the moment." (P1, Q18.a.)*

Regarding the school scheme, P4 prefers to have a physical school scheme instead of a digital one as she tries to limit the digital activities at home. *"But we may not be so digital on behalf of our children either. We are actually trying to keep the kids from being so digital. We have a schedule where, just like in the old days where we write it down and that is what they stick to. So I don't think you have to… need to have one of those phones and look at it to check what kind of activities you are going to have today, because woops, something ticks in and then they sit like this 2 minutes later." (P4, Q1.7.d.)*

P4 also finds the name Calendar misleading as she does not see it as a Calendar, but as a school scheme. She thinks in general that several functions in Aula are called something unintuitive: *"I should be named scheme, because it is what it is. It is not a calendar. I think it would be smart if they used some of the words you use in everyday speech instead of coming up with something new you have to learn in order to navigate it. Well, like "remember to go to the Come/Go function because (…)" How about just letting it be called Absence or… jah…"* (P4, Q15.b)

Another issue regarding the information provided in the Calendar, which P4 finds useless. She thinks that Aula uses too much space for irrelevant information such as birthdays (See Figure 33, 34 and 35): *"Yes, like important dates, then is it the childrens' birthdays that are in there, the class… From my point of view, is it not an important date." (P4, Q1.7.f.)*

Figure 33: Children's birthdays shown on the front page in the Calendar.

Figure 34: It is possible to add the filter 'Birthdays' in the Calendar menu and thereafter all the upcoming birthdays are shown on the calendars front page.

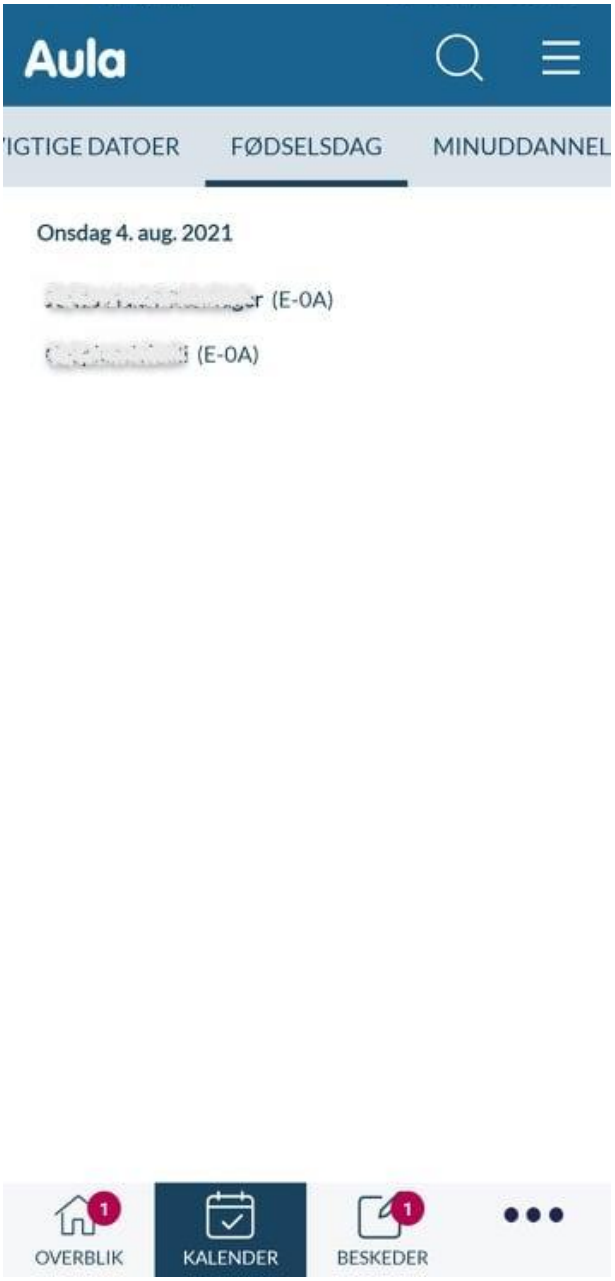

Figure 35: It is also possible to choose Birthdays (Fødelsdag) in the top menu in the Calendar.

P4 does not really use the Calendar and points out an issue regarding holidays. She once looked for her children's holiday in the calendar, but was not able to find it and therefore went to the schools website instead, in order to find the dates for the obligatory school holidays (P4, Q1.7.e.).

"I think I tried to go there and look for the summer holiday. I was just like, can I count on

that? - Where is their summer vacation located? But then I just went to the school's website, right (...) So I do not use it at all." (P4, Q1.7.e.).

According to the participants, the Calendar lacks updates, contains information, which some of the participants find irrelevant, such as birthdays, and information which the users would prefer to find or intuitively would think was placed in the Calendar, such as holidays, is missing. P4 also finds it difficult to check whether the children's holidays have been notified or not. Sometimes she receives several reminders from the school and then she sometimes doubts if she has already notified the holidays. *"Yes, and then there is a thing with, you get such important messages where you, where they ask us to ehm, to notify vacation in the Calendar for example. And then I have experienced that I have reported their holiday, but because they keep sending reminders out, I doubt if I have done it or not and then I do it again, because I do not know how to control if I have reported their holiday or not." (P4, Q9.c.)*

Figure 36 shows that a user has notified holidays multiple times. If a user selects the filter Holiday/Off (Ferie/Fri) in the Calendar menu (See Figure 37), it is possible to filter out these events in order to see if a holiday has been notified.

Figure 36: shows that the user has notified her childrens' holiday multiple times. All the attempts are noticeable in the Calendar.

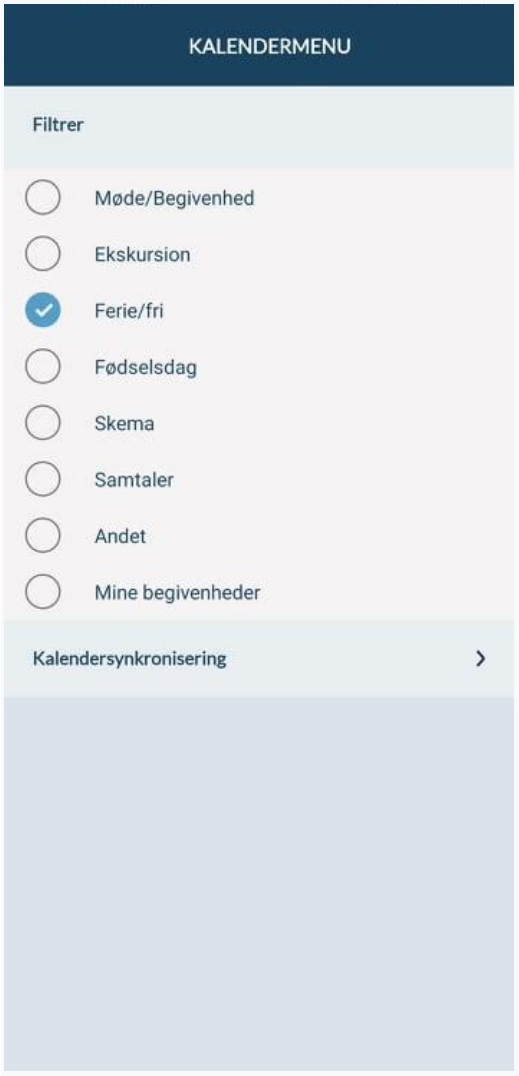

Figure 37: Choose the filter 'Holiday/Off' (Ferie/Fri) in the Calendar menu in order to see if the holidays have been notified.

In order to solve the issue, P4 suggests that it should be possible to notify absence in the Calendar as she would find it would be more intuitive: *"You go to the Calendar and then you could, via the Calendar click on a day and then you could say 'my child is not coming'. Right? Then there is the possibility to go behind the Calendar, that it was not that cumbersome that you have to go to something called the Come/Go function, it is like totally ridiculous - a word that nobody would have thought of - well, Come/Go it must be something related to 'what time do I arrive and what time do I leave'. It has nothing to do with if my child is sick." (P4, Q15.b)*

Based on the parents' experiences with the Calendar function in Aula, we have elicited the following user requirements:

> UR7: The user should be able to see an overview of the whole week in the Calendar.
>
> UR8: The calendar should contain information about events such as official school holidays.
>
> UR9: The user should be able to 'Notify Absence in the Calendar.
>
> UR10: The Calendar should either be renamed, or function more as a regular calendar.

4.5.7. Reflections

In order to avoid miscommunication, it is essential to make sure that the user requirements are clearly articulated (Rogers, Sharp & Preece, 2019b). Our participants have many requirements, wishes and suggestions for improvements. Regarding some of the user requirements, we were not able to fully document or identify the underlying problem. As we do not have documentation or a clear understanding of why these requirements are essential, we cannot take them into consideration in the following stages of the thesis. These requirements would need further investigation in order to understand the users' experience and needs correctly, and could, for instance, be further investigated in a second iteration. Therefore, the focus in the *Design stage* does only concern the user requirements that are clearly articulated and well-documented.

The user requirements that we have not been able to fully document concerns the following requirements:

> UR2: The message function should contain fewer clicks, when sending a new message.

UR2a: The user should not be asked to save the chosen recipient, in order to be allowed to send a message.

UR3: The sequence in comments and replies should be more logical and intuitive.

UR5: When the users type in who is going to pick up their child on a specific day, the system should not automatically assume that it will be a weekly event. The box should not be ticked off on beforehand, instead the users should tick it off actively if they want it to be a weekly event.

UR6: The function 'Free Text' should be more intuitive and it should be easier for the user to notify who will pick up their child.

UR7: The user should be able to see an overview of the whole week in the Calendar.

UR10: The Calendar should either be renamed, or function more as a regular calendar.

When exploring Aula's app, we experienced that some of the requirements already seemed to be a feature within Aula. We do not know whether the features have been updated or integrated in Aula after we have collected our data, or if there might have been miscommunication between us and the interviewees.

Regarding UR2 + UR2a, we encountered the problem that if we removed the 'Save' function it would in some circumstances require the user to perform even more clicks than it is currently required. If the user would like to add more than one recipient (See Figure 38) to the new message and the save function was not there, it would require the user to go back and forth multiple times, until all the desired recipients were selected. We, therefore, decided not to remove the 'Save' function from Messages, as it in some cases would intensify the problem.

Figure 38: Possibility to select more than one receiver and then the user click on safe in order to add them to the draft.

Regarding UR3, were we not able to fully document the problems that P7 experiences. We were not able to identify the issue when investigating Aula after the interview session. We would therefore need to get a clarification of the issue, before being able to create a design solution.

Regarding UR5 it is in one of Aula's official guides (Vejledning i komme/gå, n.d.), illustrated how the user actively has to mark the area "Continue weekly' (See Figure 39). According to Aula, the area 'Continue weekly' is therefore not beforehand marked as a continuous event. However, in order to get a clear understanding of the problem that the user experiences, we would have to talk to the user again in order to be able to clearly understand and document the problem.

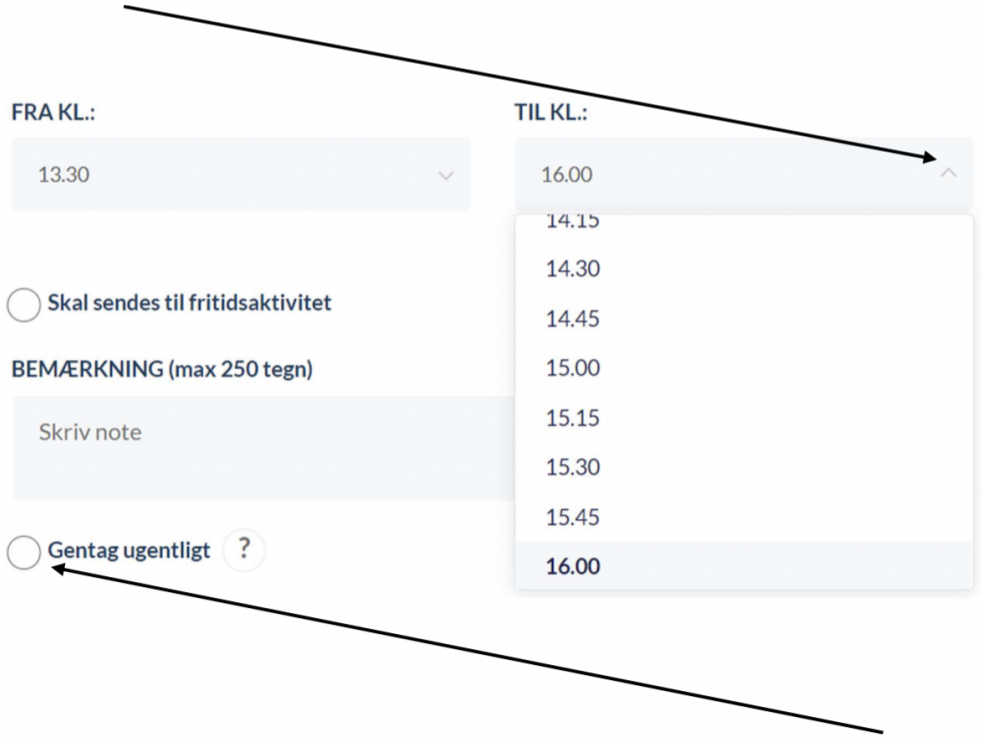

Figure 39: If the user would like it to be a continuous event, click on 'Continue weekly' (Gentag ugentligt).

Regarding UR6 do we not have documentation for the function Free text. It would therefore be necessary to talk to the user again in order to be able to document the requirement and clearly understand the underlying problem.

Regarding UR7, we discovered that it is already a feature in Aula's app to be able to see an overview of the whole week in the Calendar (See Figure 40). To be able to see an overview of the whole week, the user can go to the Calendar menu (See Figure 41) and

choose for example ‘Scheme’ (Skema), then go back to the Calendar and click on a day (See Figure 42) and then rotate the screen by turning the phone.

Figure 40: Chose the filter ‘Scheme’ (Skema) in the Calendar

Figure 41: The filter Scheme is applied and August 17th has been selected.

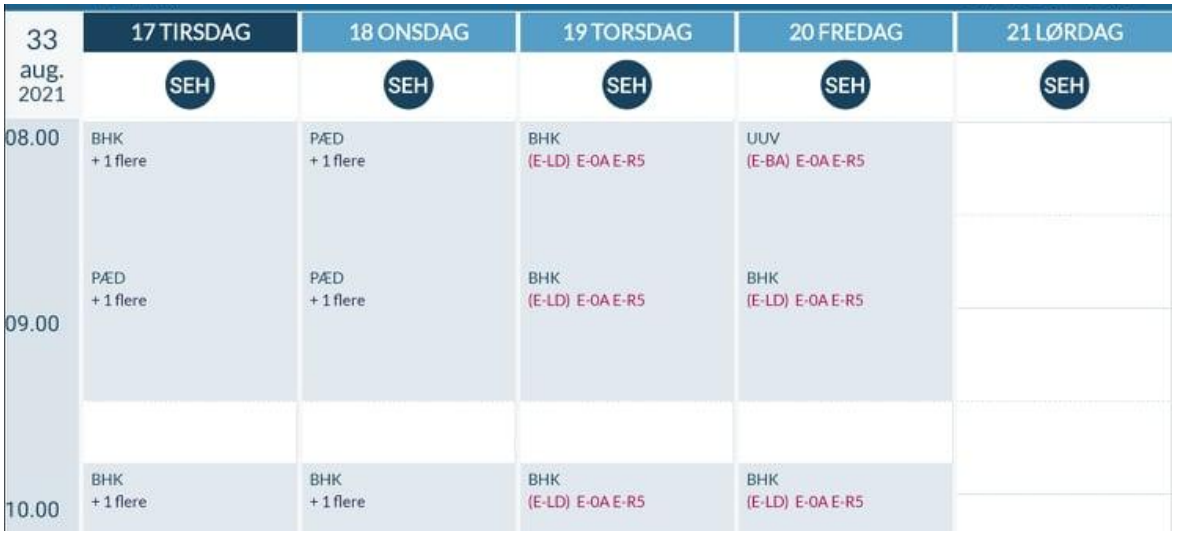

Figure 42: Overview of the school scheme for the whole week.

Some of the user requirements concern the commissioning of Aula, and are therefore also not included in the further processes of this thesis. It concerns UR10: The calendar should contain information about events such as summer holiday and vacations. This requirement requires that the school updates the Calendar with information about the school holidays.

Regarding UR10, the Calendar contains more information than just the school scheme (See Figure 40), which is why we do not take this requirement into consideration in the ideate stage.

In the following section we present *How Might We … ?* technique and how we have used it to develop our design solution.

4.6. *How might we… ?*

After the data have been gathered and analysed, it is necessary to look at the insights in order to frame them into opportunities or alternatives that would help to find a possible solution for our research. In order to do that, we have chosen to use the *How might*

we…? (hereafter HMW) technique, which is used for brainstorming new opportunities within ideation processes. HMW helps to frame questions that further help to reframe the problem and to phrase challenges into opportunities for new designs. The "How might we… ?" question is a specific phrase that always begins identically the same ensuring an unified version of design challenge (Siemon, Becker & Robra-Bissantz, 2018).

HMW format allows us to answer the questions in various ways in order to solve the challenge. Even though HMW does not suggest a specific solution in order to solve the problem, it helps to trigger innovative thinking (Siemon, Becker & Robra-Bissantz, 2018). The main purpose of using HMW questions is to explore further aspects of a specific problem, so that there is an appropriate problem for the subsequent design thinking process (Holderfield, 2017).

In order to formulate HMW questions, it is necessary to follow up on the research phase just before the ideation phase begins. It helps to transform the insights from user research into HMW questions. One can choose to create one overall HMW question or many different HMW questions. A good HMW question should be developed using a clear and understandable language, and it should motivate us to research new and alternate facets of the problem area. Besides that, HMW questions should neither be too broad or too narrow (Siemon, Becker & Robra-Bissantz, 2018).

We have looked into the user requirements that we considered as the ones having the highest impact on the collaboration and communication between school and home.

The HMW questions regarding different user requirements are presented below.

HMW within *Messages* function:

UR1: It should be avoided that users accidently reply to all recipients of a message, when the intention was to reply to the sender only.

HMW1: How might we make it more visible for the user to see that he or she is replying to the sender only or all the recipients?

HMW within the *Come/Go* function:

UR4: The user should be able to 'Notify Absence' once instead of twice. The user should not have to both text the teacher and mark the child 'as fri' in Come/Go.

UR4a: The user should be able to 'Notify Absence' in Aula without having to text the teacher.

HMW4 + 4a: How might we make it more simple for the parents to report their childrens' absence for both school and after-school-center?

HMW within the *Calendar* function:

UR9: The user should be able to 'Notify Absence' in the Calendar.

HMW9: How might we make it possible for the parents to notify absence in the Calendar?

In the next chapter we will illustrate how we have used HMW to brainstorm and sketch ideas for our design solution.

Ideate stage

describe the design process and present our design ideas. In order to do that we have used sketching as a technique to visualise the design ideas to find out which of the ideas would solve the problems in the best possible way. After the final ideas are selected, system requirements have been defined in order to describe what features Aula should contain in order to fulfill the users needs.

5. Design

Within this chapter we describe and present the design process (Figure 43). Brainstorming and sketching helped us to convert user requirements into design ideas, as well as to select which of the potential solutions that can be useful in order to solve the problems within Aula. Within this section we also present the system requirements describing the features Aula should contain in order to meet the needs of parents.

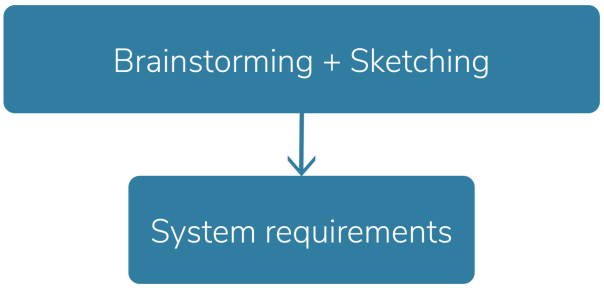

Figure 43: Design process.

5.1. Brainstorming methodology

Brainstorming is a technique that helps to generate ideas both individually, as well as within groups. Brainstorming in groups fosters creativity by which thoughts and ideas are shared among members spontaneously in order to find possible solutions to practical problems (Gogus, 2012). Brainstorming within groups was first introduced by Osborn in 1957 with the main purpose to increase creativity in corporate settings (Osborn, 1957). After that brainstorming was expanded to several various settings and areas, including higher education where it has been commonly used in order to generate ideas, clarifications, and solutions (Unin & Bearing, 2016).

Brainstorming techniques can be either verbal/traditional, nominal, or electronic. Within verbal/traditional brainstorming group members actively participate in an active dialogue and interaction by verbally sharing their thoughts and ideas one at a time. This form of brainstorming helps to stimulate the production of a large amount of ideas, ruling out criticism, and combining ideas throughout the session (Miller, 2009). Within nominal brainstorming group members can generate ideas individually without communicating with other group members (Henningsen & Henningsen, 2013). Furthermore, within electronic brainstorming group members generate ideas simultaneously. It involves the use of online resources and tools such as email, browser-based systems, discussion forums or chat that support the idea generation process (Baruah & Paulus, 2016).

5.2. Sketching methodology

Sketching is a technique that is commonly used in design, engineering, architecture, and more generally in innovation processes. Sketches help designers to lay out, clarify, store, reflect on, and share their ideas with others. Sketching is a great method in order to put thoughts on paper, whether when describing thoughts or ideas to others within a group or brainstorming new solutions individually. The main reason for sketching is not to sketch something revolutionary, but to generate many ideas at once. The point is to have a varied and large amount of thoughts to work from and build upon (Kirsh, 2010; Tversky, 2014).

Sketches are mainly made quickly, and they contain minimal detail (Buxton, 2007). Sketches are not commonly sent to a client, but are seen more like suggestions of where the idea is heading towards. However, most of the ideas that are sketched out will likely never be developed further (Patel, 2020).

There are several situations when sketching can be useful, including situations when visualising complex information, collaborating to iterate upon an existing concept,

sharing raw and forgeable ideas with others, or brainstorming new solutions or designs (Kirsh, 2010).

5.3. Process and development of brainstorming & sketching

We have used the HMW method (within the define stage) in order to begin idea generation, and after we have created all the HMW questions, we started brainstorming on how to find possible solutions for improvements. We brainstormed ideas and sketched them out on a paper right away to visualise our ideas and build upon them. We have kept user requirements in mind throughout the brainstorming and sketching process to ensure that our design solution would fulfill user needs and requirements. We have chosen to use verbal/traditional brainstorming as it encouraged each of us to actively participate in the process. We brainstormed on each of the HMW questions and shared our ideas, discussed possible solutions, as well as created sketches for each of them. The Figures (44, 45, 46, 47 and 48) below present our brainstorming and sketching process.

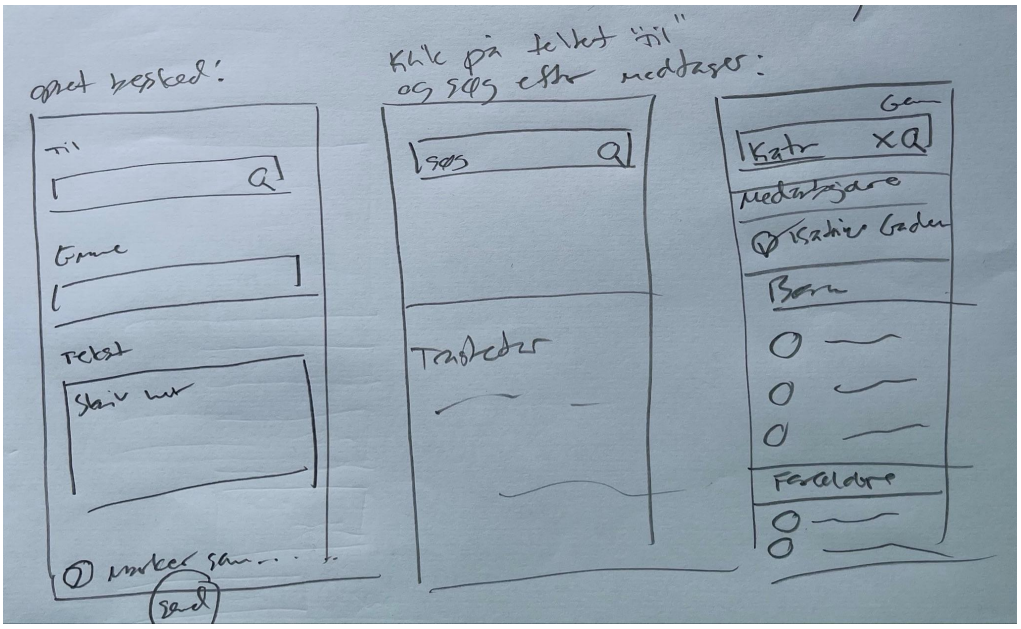

Figure 44: Sketching process - Messages.

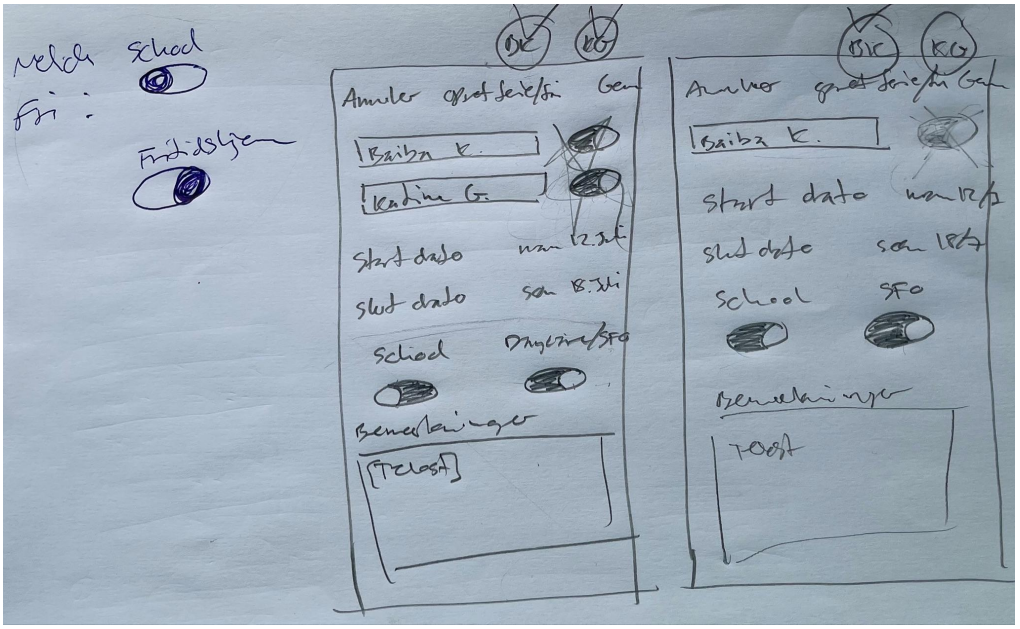

Figure 45: Sketching process - Come/Go and Calendar.

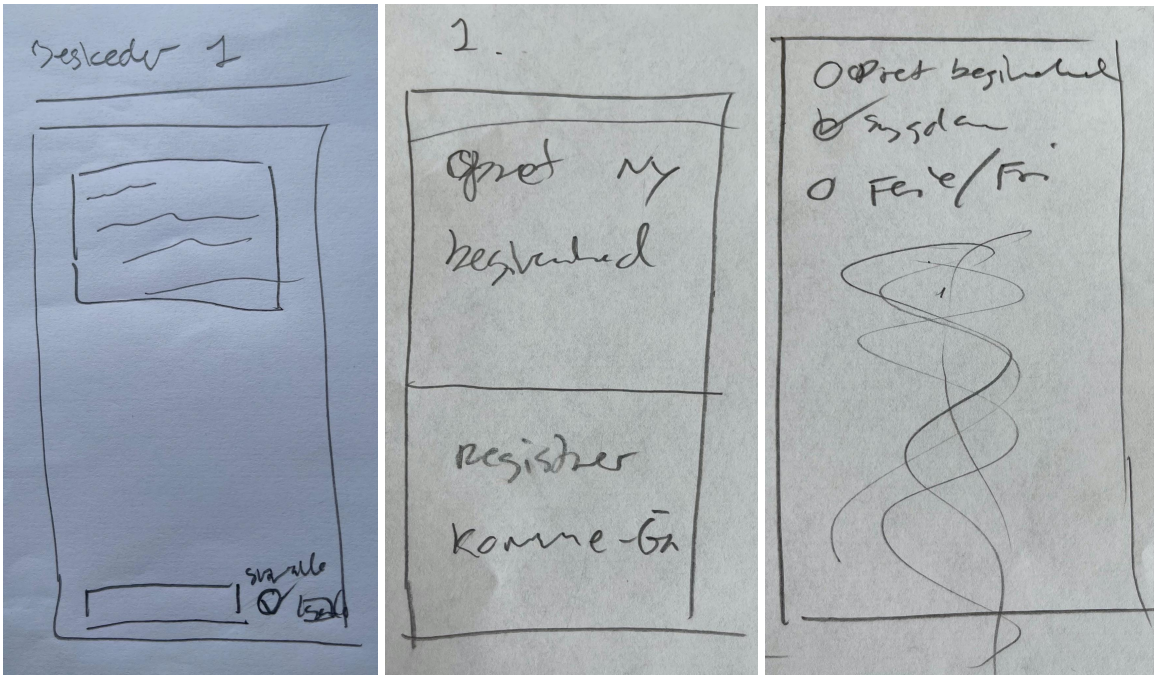

Figure 46, 47, 48: Sketching process - Messages, Come/Go and Calendar.

5.4. System requirements

Requirements are discovered in order to define what needs to be developed. When working with interaction design, discovering requirements include understanding the target group and their capabilities, and it is necessary to define how a new product can support users in their daily lives. Besides that, tasks and goals that users have to accomplish, the context and constraints are important as well. The understanding of these things creates a foundation for the requirements, as well as it underpins the design and construction. In an iterative development cycle requirements, design and evaluation are closely related, which can make it difficult to distinguish between them as they are intertwined in an iterative design and development process. Each of them has a goal, they emphasise differently and they are all necessary in order to design a quality product (Rogers, Sharp & Preece, 2019b). *"The goal of an iterative user-centered approach is to involve different perspectives and make sure that there is agreement."* (Rogers, Sharp & Preece, 2019b: p. 387).

The system requirements are based on the user requirements and describe the features Aula should contain in order to meet the parents' needs. These requirements should be developed and incorporated in Aula in order to improve the user experience as well as the school-home communication and collaboration. The system requirements are presented below.

SR1 (UR1): The system should help avoid that parents accidently reply to all, when the intention was to reply to the sender only.

> SR1a: When a user types in a reply in the main text field and clicks "Send", the message is automatically sent to the sender only.
>
> SR1b: If the user wishes to reply to all recipients, it should be an active choice.

SR2 (UR4+UR4a): In Come/Go the user should be able to notify absence to the school as well as after school centers.

SR3 (UR9): The Calendar should contain a function where parents have the possibility to notify their children's absence.

Prototype stage

provides a presentation of our prototype and description of its development process. Wireframes and mock-ups were created in order to present how the design solution would look like, and used in order to build our prototype. The prototype is used within the last stage of the process in order to determine if we have understood parents' needs correctly. When a prototype has been created, it should be tested and evaluated. The evaluation of a prototype takes place within the next stage of the design thinking process - the test stage.

6. Prototyping

Within this chapter we describe and present the process of how the prototype was built (Figure 49). Firstly, wireframes were created in order to build the structure for screens of our design solution. Afterwards mock-ups were created presenting the content and visual design. Lastly, the prototype of our design solution is presented, which is later used for evaluation. This will be further elaborated in the test stage.

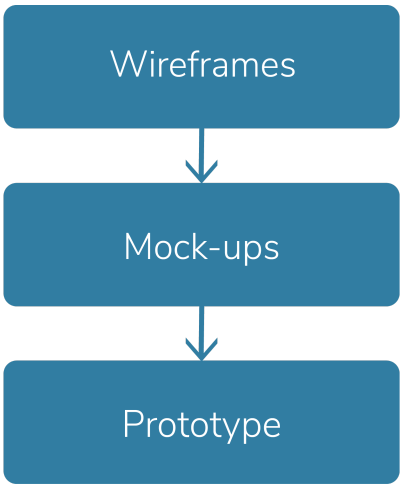

Figure 49: Process of prototype building.

6.1. Wireframes

Wireframes are basic visual guides in which elements for screens and webpages are proposed in order to establish a structure and flow of possible design solutions. Wireframes help to lay out content and functionality on a page, which takes user needs and user journeys into account. Most commonly wireframes are used early in the development process as they establish the basic structure of a page before content and visual design is added to it. Furthermore, wireframing can be done either by hand or with software, creating low- to high-fidelity versions (Morville & Rosenfeld, 2006). The main reason for making wireframes is to provide a visual understanding of a page early

in a project in order to get approval from stakeholders and the project team before the development process starts (Morville & Rosenfeld, 2006).

The figures 50, 51 and 52 below present high-fidelity wireframes that have been created by using Adobe Illustrator. The wireframes are made in order to subsequently build mock-ups that represent how our design solution looks.

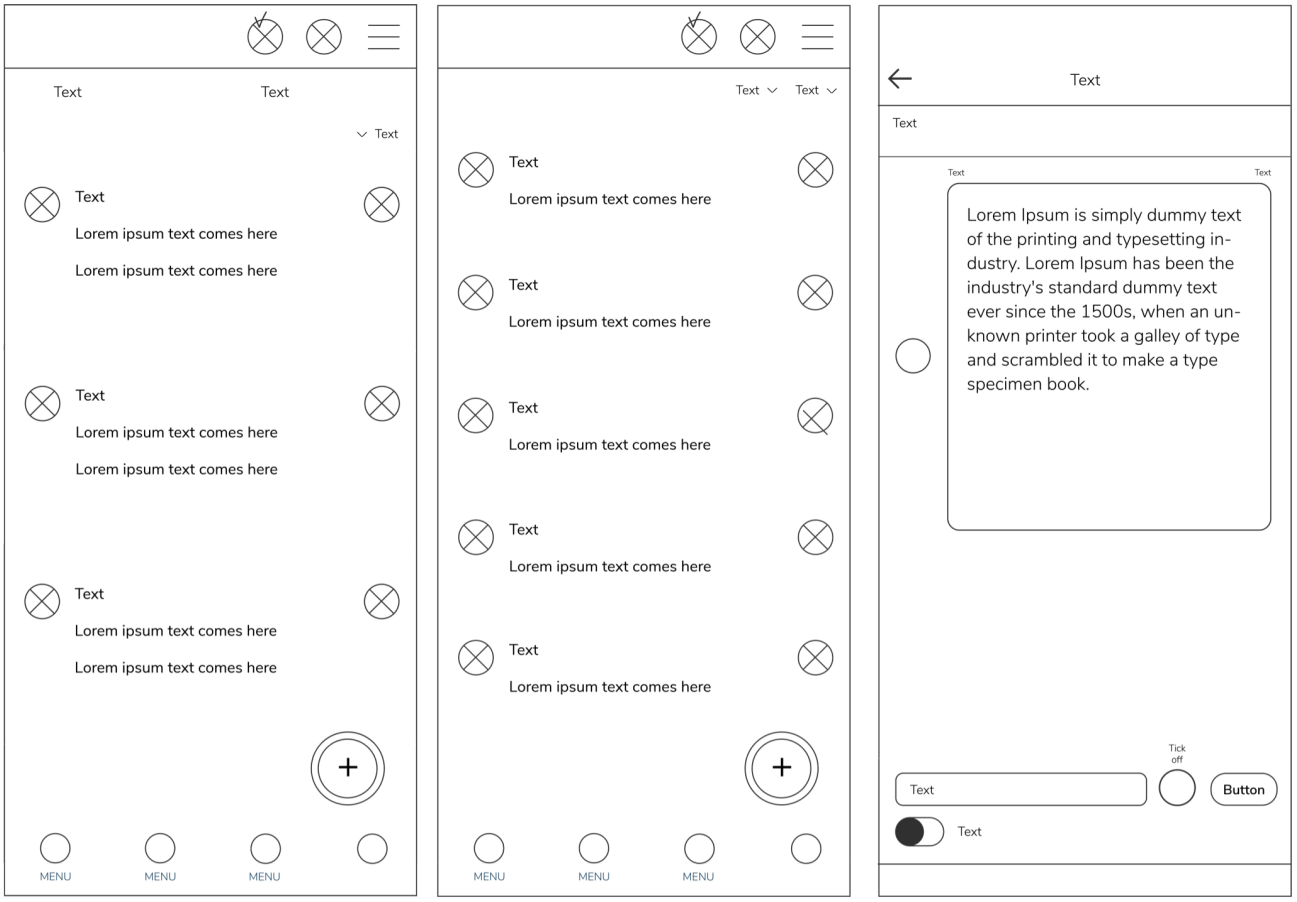

Figure 50: Wireframes - Messages.

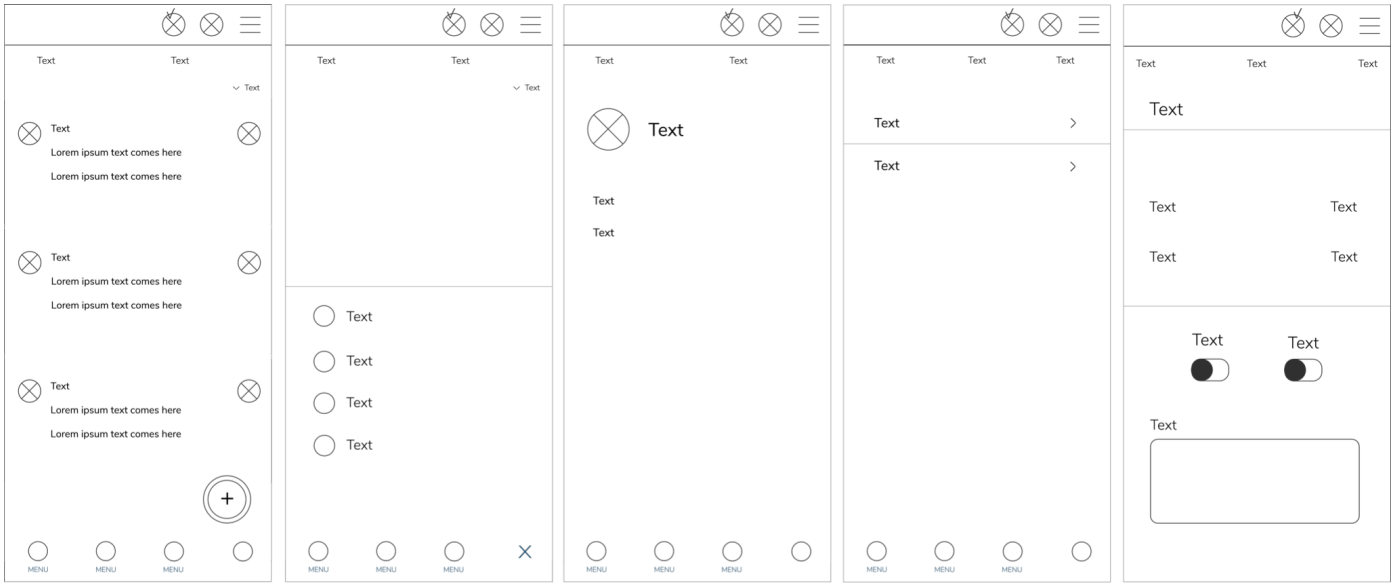

Figure 51: Wireframes - Come/Go.

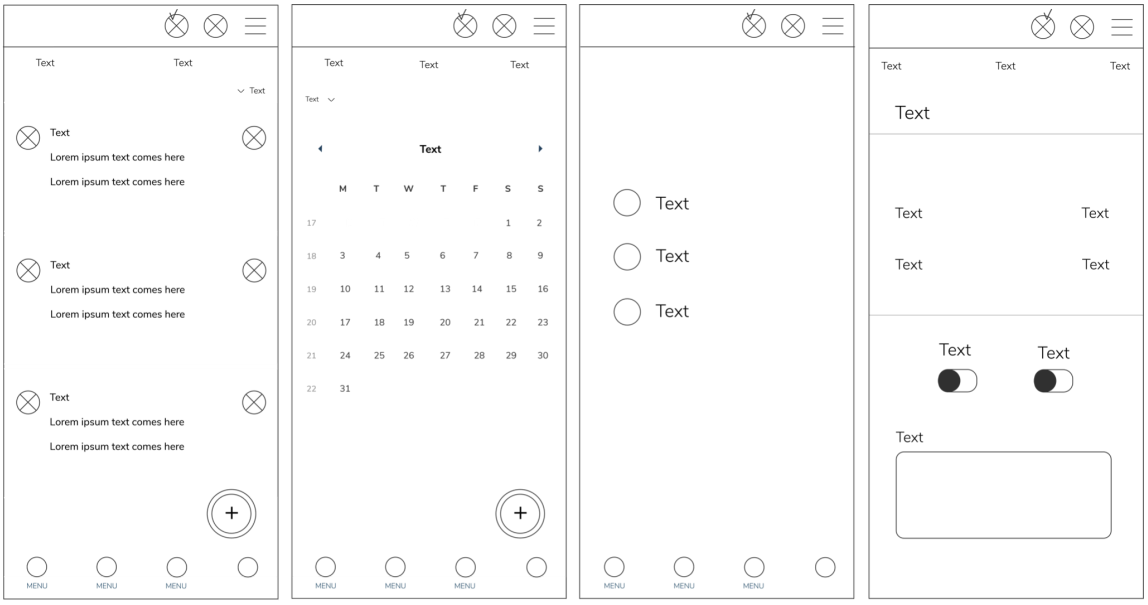

Figure 52: Wireframes - Calendar.

6.2. Mock-ups

Mock-ups are mainly used in order to acquire feedback from users regarding design early in the design process. In other words, mock-ups are ‘very-early prototypes’ made of cardboard or other low-fidelity materials. Mock-ups typically reflect the design choices for color schemes, typography, layout, iconography, visuals of navigation, and the overall atmosphere of the product (Vuillemot & Boy, 2018).

Mock-ups can be tested on the target users of the product. Target users are imagining that the mockup works as a real product and aided by the designer tries to test it. In a perfect scenario, the testing provides designers with valuable feedback about the functionality, usability and understanding of the basic design idea, which can be used later in order to improve the product (Vuillemot & Boy, 2018).

There are several benefits using mock-ups, including the fact that mock-ups allow usability testing early within the development process. Another benefit using mock-ups is that mock-up functions as a discussion not only between a designer and a user, but also between members of the design team. Besides that, as mock-ups are low-cost, they incite criticism from users as they are likely to be more direct and criticize the product if they see that the product is within its early stage (Peavey, Zoss & Watkins, 2012).

The figures 53, 54 and 55 below present mock-ups that are created in order to make a prototype for our design solution, and that are further used in order to create a prototype.

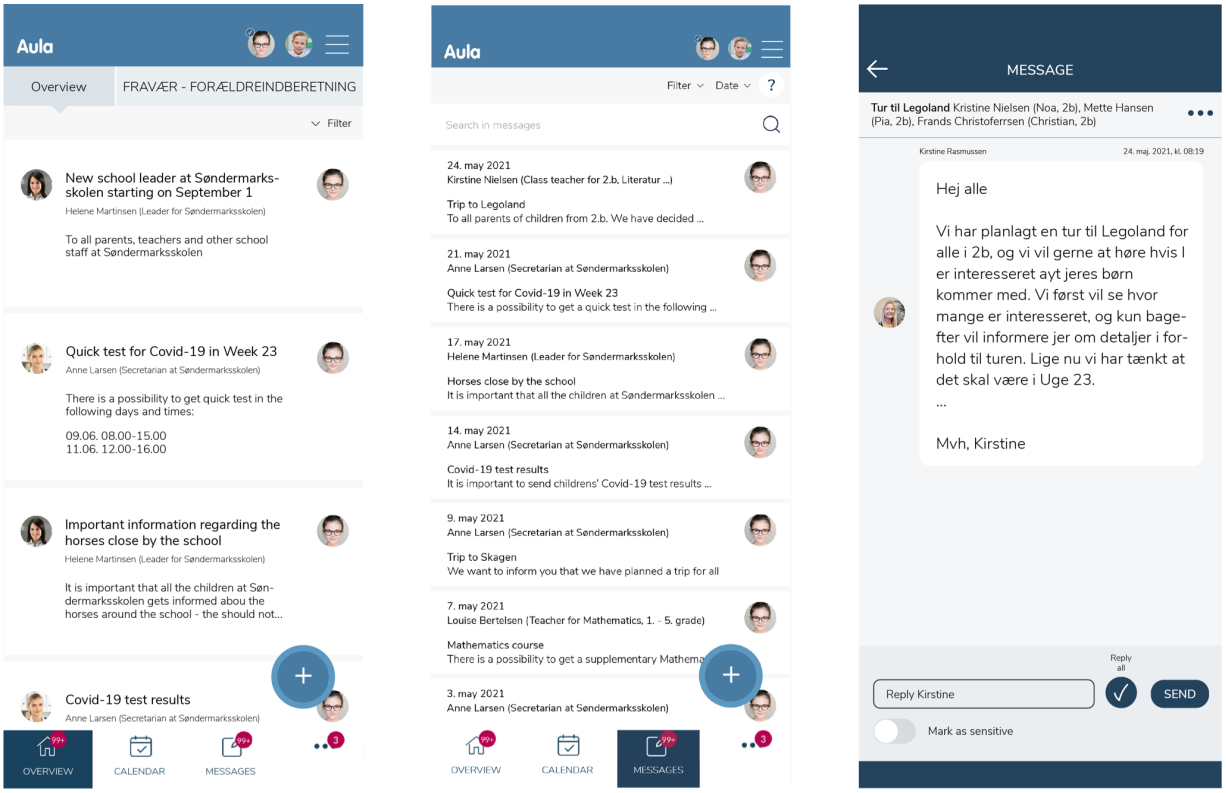

Figure 53: Mock-ups - Messages.

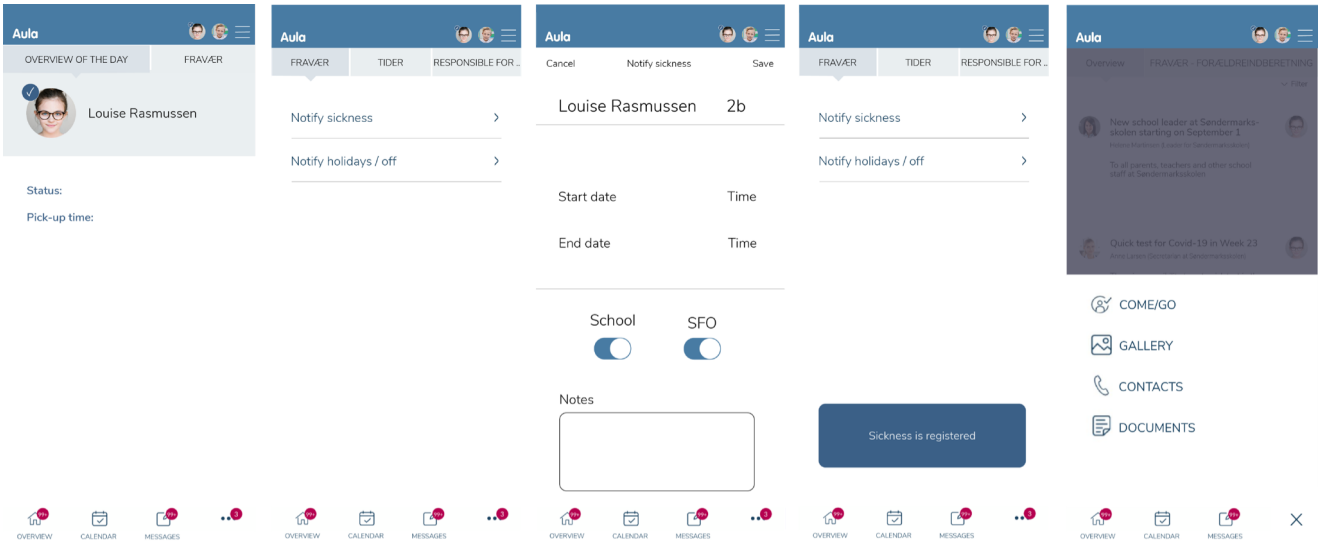

Figure 54: Mock-ups - Come/Go.

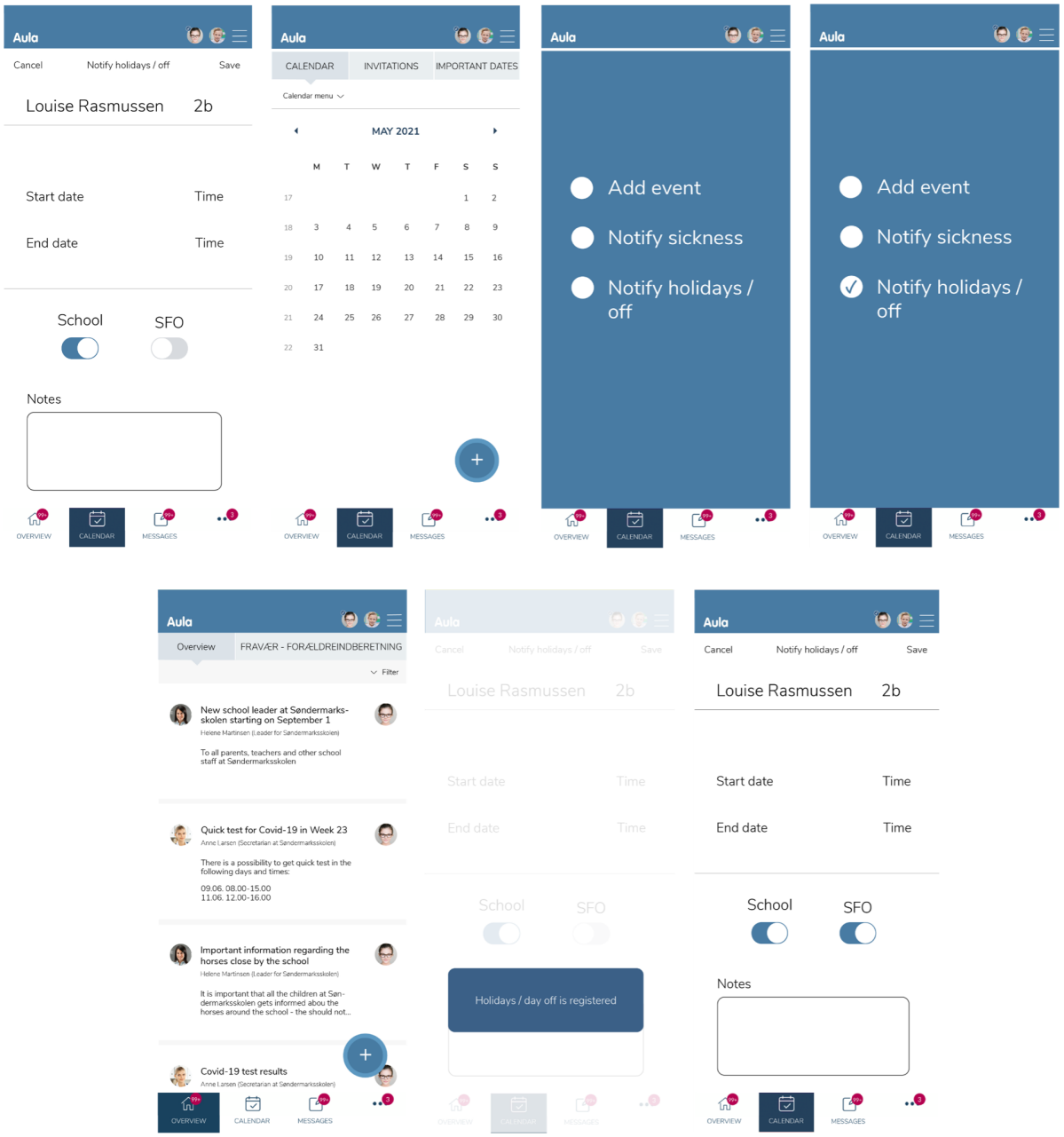

Figure 55: Mock-ups - Calendar.

6.3. Prototype

Interaction design involves designing not only the look and feel of interactive products, but also the behavior of the interactivity with them, as well as exploring its suitability.

Interaction of these products can be evaluated by allowing users to interact with them, which can be done through prototyping (Rogers, Sharp & Preece, 2019c).

Prototypes take many forms and they can be created using different prototyping techniques, varying from a paper-based prototype to a complex piece of software. Prototypes can be used in order to explore design ideas for designers, as well as discuss or evaluate ideas with stakeholders. Besides that, prototypes help to test the technical feasibility of an idea, to clarify vague requirements, or to do user testing and evaluation of an idea. There are several purposes of a prototype and they vary based on what kind of prototype is needed to be built (Rogers, Sharp & Preece, 2019c).

Types of prototypes are divided into two categories: *low-* or *high-fidelity* prototypes. Low fidelity prototypes do not look like a final product and they do not provide functionality of a final product. Storyboarding, sketching and Wizard of Oz are some of the examples of low-fidelity prototypes. Contrary, high-fidelity prototypes look like the final product and typically provide much more functionality in comparison to low-fidelity prototypes (Rogers, Sharp & Preece, 2019c).

We have chosen to build a high-fidelity prototype for our design solution using the Marvel app (Marvel, n.d.), which allowed us to build a digital prototype online. As we have several functions and features to test within our design solution, we have created three simple prototypes. We are using these prototypes in usability testing, allowing users and potential users of Aula to test our design solution in order to evaluate it and give us feedback on it.

The Figures 56, 57 and 58 below present our prototype, and the digital clickable prototypes for our solution can be found here:

Prototype 1 - Message function (reply-all)
Prototype 2 - Come/Go function (notify absence in one place)
Prototype 3 - Calendar function (notify absence using calendar)

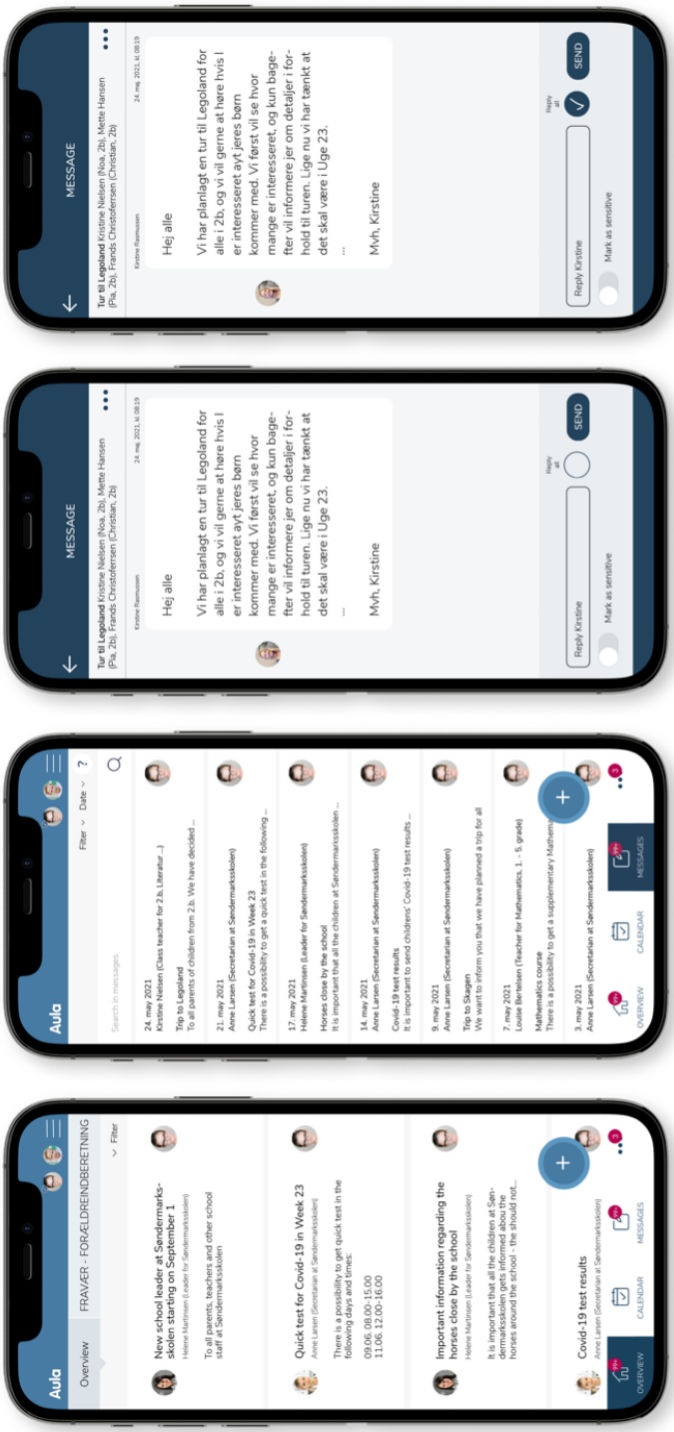

Figure 56: Prototype 1 - Message function.

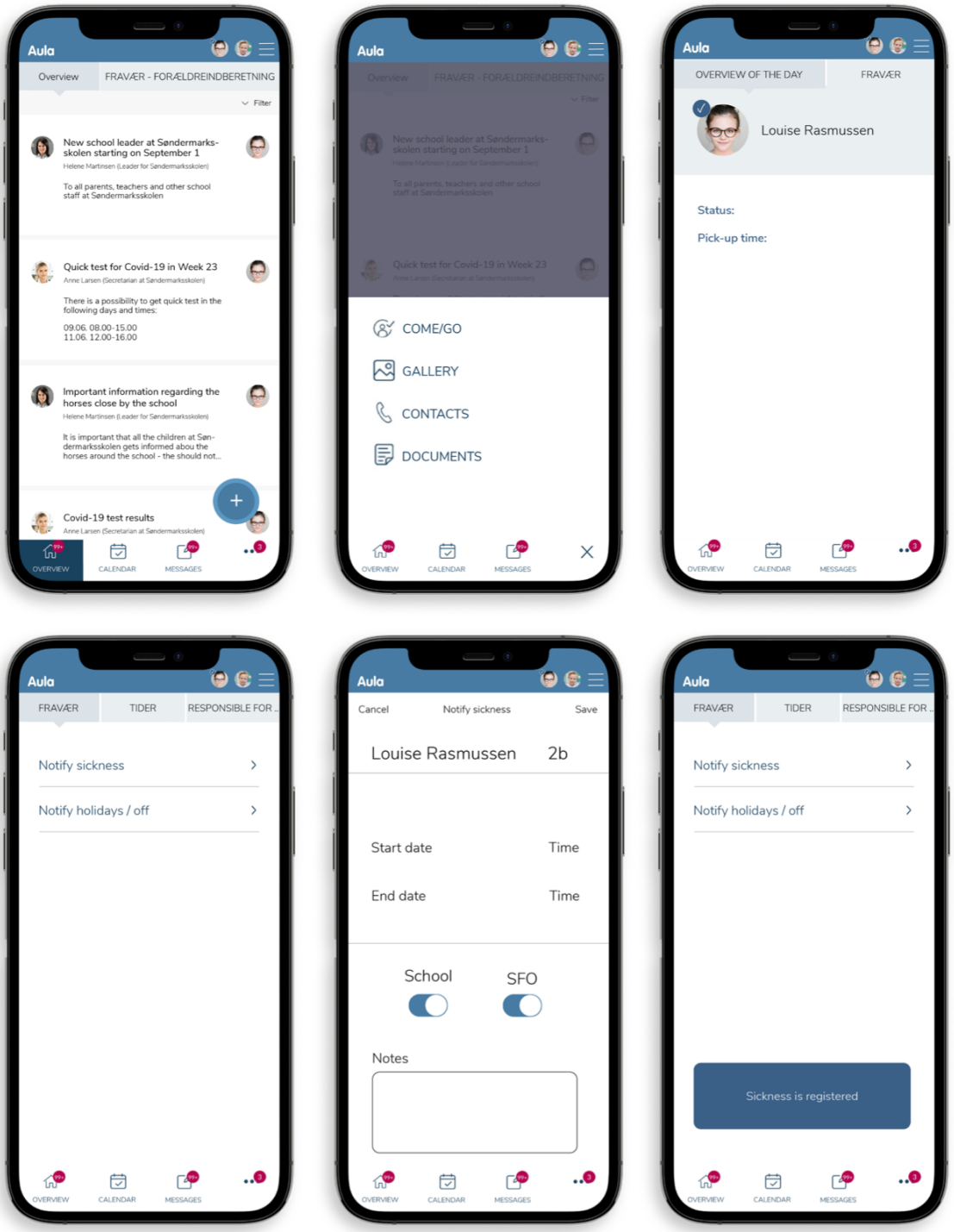

Figure 57: Prototype 2 - Come/Go function.

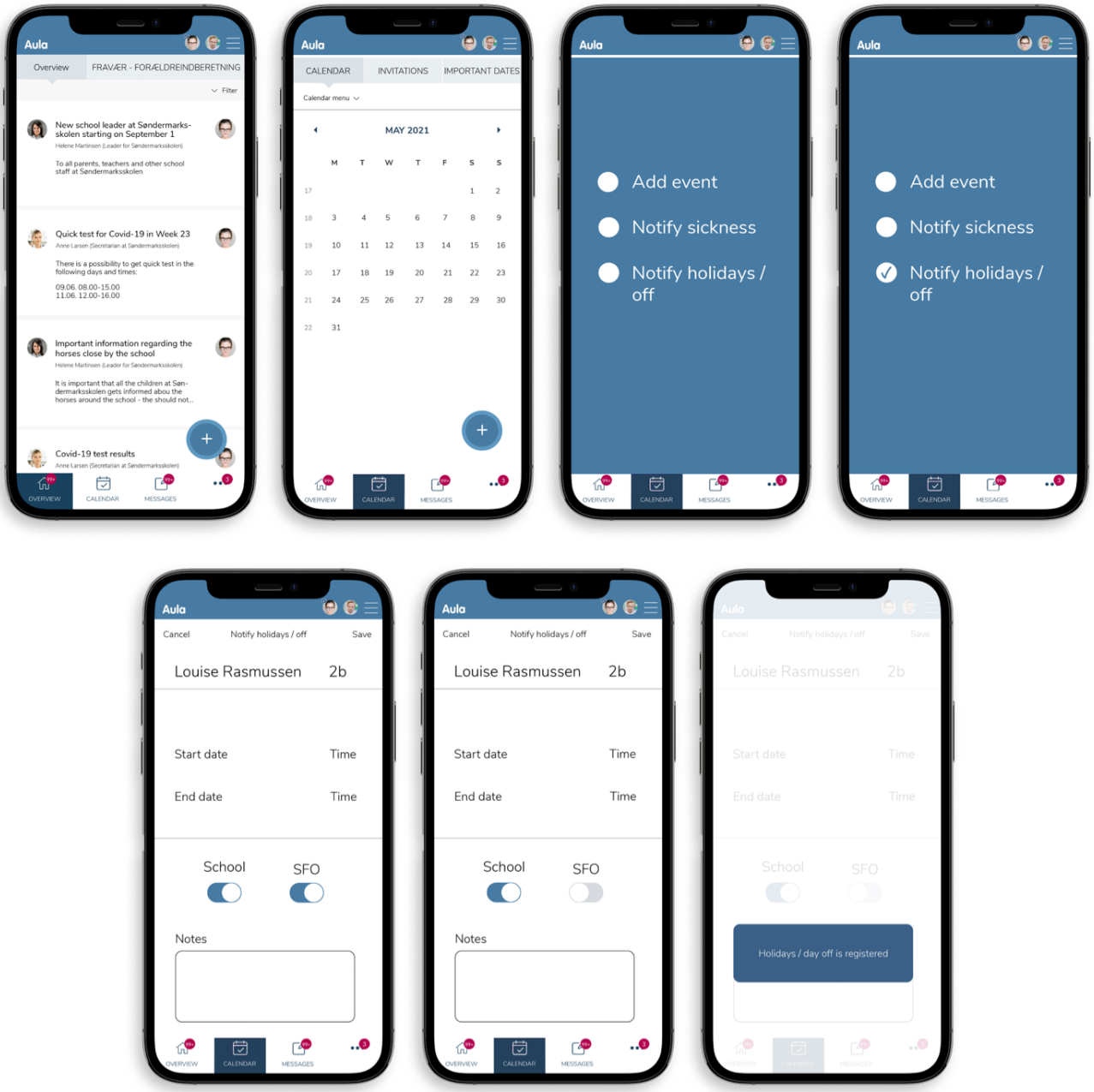

Figure 58: Prototype 3 - Calendar.

Test stage

presents the evaluation of our design solution including the process and test results. Within the test stage our design solution is tested on both Aula users and potential Aula users. By conducting the test sessions we aim to see if we have understood the users needs correctly and if our design solution are qualified.

7. Evaluation

This chapter presents the evaluation process of our design solution and the outcome of it (See Figure 59). Firstly, personas have been created in order to represent the target users of Aula based on the data we have collected earlier in the research process. Personas were further used to create scenarios, telling stories about the experiences parents have regarding the specific functions in Aula. Scenarios, accordingly, were further used to allow the test participants to imagine specific situations and the context of the problem, making it easier for them to imagine the problems in real-life settings. Usability tests were conducted in combination with the Think Aloud technique, which helped us to get an understanding of the participants' thoughts while testing and evaluating our design solutions. The test sessions helped us to evaluate whether we have understood the users needs correctly and if our design solutions are qualified.

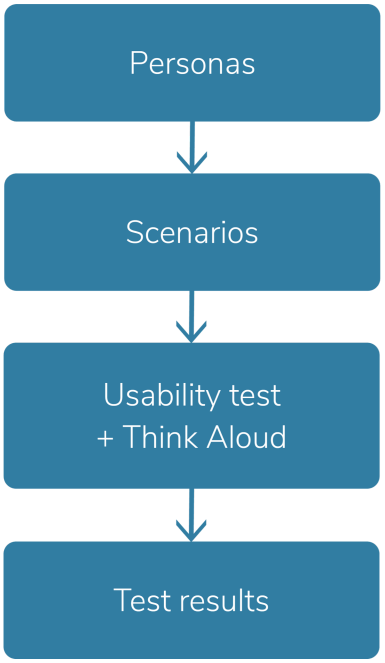

Figure 59: Evaluation process.

As user experience concerns all aspects of a user's interaction with a product, evaluation is about collecting and analysing data, about existing or potential users' experience of a product. The goal of evaluation is to improve the design of an artifact and focuses both on the usability of a system and on the user's experience when interacting with the system (Rogers, Sharp & Preece, 2019d). By evaluating a product, the designers can check if the design is acceptable and appropriate for the target user population (Rogers, Sharp & Preece, 2019d). When creating design ideas, an evaluation of these can be used to see if the designers have understood and interpreted the users requirements correctly and if the requirements are integrated in the design (Rogers, Sharp & Preece, 2019d).

7.1. Personas

In order to represent the target users of Aula, personas have been created based on the data collected in the contextual inquiry and interview sessions.

A persona is an archetype which is built on different attributes about real users of a product or a service. Personas were originally developed from being a method for IT system development to being used in many different contexts, including marketing, planning of communication, development of products, and service design (Nielsen, 2004). Personas are most valuable to create before starting to develop a product or a service, a redesign or a new identity as they help to to determine and clarify user goals (Friess, 2015). Nevertheless, personas can also be used when introducing an existing product or service to a new market (Kuniavsky, Goodman, & Moed, 2012a). Use of personas have several different benefits, ranging from increasing the focus on users and their needs, to having direct influence on design. Personas are also an effective communication tool, and it helps to define the product’s feature set (Miaskiewicz & Kozar, 2011).

However, there are also several drawbacks by using personas which need to be kept in mind when creating them. First of all, different personas are representative of the areas of the target market, meaning that one persona is not enough as it cannot represent the full spectrum of the users. Moreover, by creating too many personas, there is a risk of overlapping them. Therefore, one might ensure that different types of users are used as a basis for creating different types of personas (Idoughi, Seffah & Kolski, 2012).

Kuniavsky et al. (2012b) recommends the following attributes that could help to build a persona:

- Demographic,
- Technological (i.e. access of the product, experience),
- Environment of usage (i.e. location, time, competition),
- Lifestyle/psychographic (i.e. cultural attributes, media, values and attitudes, activities),
- Roles (i.e. responsibilities, relationships, titles).

The attributes mentioned above have been taken into consideration within the process and development of personas.

In total we have created five personas (See Figures 60, 61, 62, 63 and 64) who illustrate representative users of Aula. The personas were developed based on the collected data within interviews and contextual inquiry sessions. As parents and their needs regarding children's schooling may differ, the represented personas are only based on the data collected within this research, and therefore are limited to only these five types of parents' profiles. Names, locations and occupations of personas have been changed to secure the confidential and private data of the interviewees. However, their names, locations and occupations have been changed to be similar to the actual data.

Name: Khaled

Age: 37

Occupation: Self-employed, owns a bike shop

Residence: Rødovre

Status: Married

Family

- Family of 5 - 2 parents and 3 kids
- Age of the kids - 7, 9 and 12
- The youngest child attends a class for children with special needs

Responsibilities within the family in terms of Aula:

- Khaled has the primarily responsibility for the school-home communication.
- The oldest child is starting to use Aula himself.
- His wife is responsible for practical stuff, but she also checks Aula and sometimes replies to messages.

About

As a business owner, Khaled is very busy on daily basis. He is involved in his childrens' schooling, but sometimes, due to his busy schedule, he finds it difficult to be a part of it. He likes to communicate with the teachers and he highly appreciates their time and help in case of a need. Khaled sees himself as a person with average IT skills. He had difficulties to learn Aula in the beginning, but after he got used to it, he finds it easy to use. Khaled typically checks Aula when he receives notification that there is something new. Otherwise he checks Aula every Friday as a week plan is available for the current week (summarising what children did the whole week) and for the next week (to know what needs to be prepared for the next week). He likes to check Aula in the evening after work to be sure that he does not miss any information.

Most used functions: Messages and Gallery

Communication channels used to communicate with school staff: Mainly Messages, in case of an urgency - phonecall

App/website: Using only Aula's app

Satisfaction with Aula: Overall satisfied with Aula, but he thinks that there is a room for improvements

Frustrations

- He finds it annoying to receive the same information multiple times because more than one child attends the same school (information is sent out for each kid even they have the same parents who receives the information).
- Redundant information sometimes annoys him..

Needs & wishes

- He would appreciate less redundancy within Aula.
- He thinks that information should be more targeted for each class.
- He would appreciate more simplified Aula.

https://media.istockphoto.com/photos/turkish-hansome-man-posing-picture-id1277150173?s=612x612

Figure 60: Persona 1.

Name: Lilian

Age: 45

Occupation: Architect

Residence: Valby

Status: Married

Family

- Family of 4 - 2 parents and 2 kids
- Age of the kids - 8, 10 and 13

Responsibilities within the family in terms of Aula:

- Lilian is primarily responsible for Aula, but her husband also sometimes checks Aula.
- The two oldest kids are independent and they try to use Aula themselves as much as they can, so the parents have less responsibility for everything regarding Aula.

About

Lilian is involved in her children's schooling as much as it is necessary. Sometimes it is annoying that school expects so much from parents knowing that nowadays parents are very busy on daily basis as they are often not only focusing on family life, but also their professional life. Her children are good at telling a lot themselves, therefore she does not have a need for communication with the school. She trusts the school system, and she believes that teachers know what they do and that they do their work well. She is very satisfied with the school, but not with Aula. Basically she does not have the need for Aula at all, as long as she knows what to prepare for the children for school (she prints out the school scheme once a week and hangs it on the fridge). She logs into Aula once a week to check next week's schedule, what happens usually on Saturday. She sees herself as an IT-expert, but does find Aula easy to use and navigate in. She thinks that it is cumbersome to use Aula.

Most used functions: Messages, would like to use Calendar if it was functioning as calendar normally should

Communication channels used to communicate with school staff: The Message-function in Aula

App/website: Using only Aula's app

Satisfaction with Aula: She thinks that Aula is too messy and not easy to use

Frustrations

- She feels like there is a lot redundant and unnecessary information on Aula.
- She cannot say anything positive about Aula.

Needs & wishes

- Aula should be more intuitive. She would appreciate better structure in Aula.
- Messages and overview should be more different from each other as she feels like there is no difference between them.

https://media.istockphoto.com/photos/portrait-mature-woman-staring-at-camera-picture-id1084663706?s=612x612

Figure 61: Persona 2.

Name: Peter

Age: 43

Occupation: Restaurant manager

Residence: Aarhus

Status: Married

Family

- Family of 4 - 2 parents and 2 kids
- Age of the kids - 9 and 12

Responsibilities within the family in terms of Aula:

- Peter and his wife share the responsibility for Aula, but he is the one primarily responsible for communication with the school.
- The oldest child checks Aula herself, so the parents have little less responsibility for it.

About

Peter is trying to be as much as enganged as possible and as his time allows. He does what is expected from parents to do. In general, Peter is very satisfied with his childrens' school. However, there are some things he does not like such as not updated school schedule and missing information from teachers. Peter usually checks Aula 1-3 times a week, but otherwise he checks every time he gets a notification about something new in Aula. He find notifications very useful and he feels like notifications helps him to not miss information from school.

- He thinks that Aula is structured, great and useful tool.
- He evaluates his IT skills as avarage.
- Peter likes to be updated about information regarding his children, their schooling and well-being.

Most used functions: Messages, Calendar and school schedule

Communication channels used to communicate with school staff: The Message-function in Aula

App/website: Using only Aula's app

Satisfaction with Aula: Overall satisfied with Aula

https://media.istockphoto.com/photos/portrait-of-family-smiling-in-yard-picture-id1141672440?s=612x612

Figure 62: Persona 3.

Name: Bettina

Age: 44

Occupation: Journalist

Residence: Østerbro

Status: Divorced

Family

- Family of 4 - her and 3 kids
- Age of the kids - 7, 9 and 12

Responsibilities within the family in terms of Aula:

- Bettina has all the responsibility for Aula.
- The oldest child is sometimes using Aula when checking up on homework.

Frustrations

- She finds it annoying to login into Aula every time.
- She do not use many functions in Aula, and she sometimes cannot remember what each function is about, which she suggests Aula to work on.

About

Bettina is involved in her children's schooling and she helps with the events at school when needed, but otherwise she does not have time enough for more engagement as her job also requires a lot of focus and energy from her. She is overall satisfied with the home-school communication and collaboration. She usually tries to check Aula every time she receives a notification. Because of the large amount of information and her busy work schedule, she looks at what is relevant here and now. It causes that she sometimes miss information. She is aware of that and she tries her best to manage her time and responsibilities. Overall, she thinks that information shared in Aula is appropriate and she does not miss information from the school. She feels like the school is always trying to communicate about everything important (and sometimes less important) to the childrens' families. Bettina is good at using IT, but Aula was a bit difficult to learn in the beginning. Now, after she has learned to use it, she feels comfortable using it.

Most used functions: Messages and Invitations

Communication channels used to communicate with school staff: The Message-function in Aula

App/website: Using only Aula's app

Satisfaction with Aula: She is overall satisfied with Aula, but thinks it is annoying to login all the time to read new information - would like to be able to read the full message/post directly in the notification

Needs & wishes

- She would like Aula to be more intuitive.
- *'Mine Grupper'* currently does not have any function. As she likes to communicate with other parents, she wishes that the function would be more useful and parents could use it for communication with each other. (Currently they use Facebook for that).
- The message function should be improved (in terms of answering all the recipients / only the sender).

https://media.istockphoto.com/photos/smiling-brunette-woman-picture-id956824696?s=612x612

Figure 63: Persona 4.

Name: Ann

Age: 37

Occupation: unemployed

Residence: Albertslund

Status: Married

Family

- Family of 4 - 2 parents and 2 kids
- Age of the kids - 6 and 13
- The oldest son attends a special class in a regular public school.

Responsibilities within the family in terms of Aula:

- Ann is fully responsible for Aula.
- The oldest son checks the homework himself.

Needs & wishes

- The information shared in Aula should be more targeted and specific as some information is often redundant.
- Filters would make her experience using Aula much more better if she could filter information after her own needs.

About

Ann highly appreciates communication and collaboration with her childrens' schools. She is very satisfied with her oldest child's school as they are very informative and they always communicate and inform about important things to childrens' families. However, it is not the same when it comes to her youngest child's school. The teachers are only communicating with parents when the situation in the class is already critical. She would like to communicate more with the school, but she does not experience the same need on the part of the school. She feels like she is receiving information too late, and it sometimes stresses her if she have to prepare things for the youngest child in the last moment as the information has been send out late. Ann usually checks Aula twice a day - after bringing the kids to school and after they are coming home from school. She finds notifications useful, but due login issues on Aula, she checks Aula more often than usual, in order to keep herself updated with the latest information and to avoid missing important information.

Most used functions: Messages, Calendar and Overview

Communication channels used to communicate with school staff: The Message-function in Aula

App/website: App and website

Satisfaction with Aula: She is satisfied with Aula, but she thinks that several areas within Aula need improvement.

Frustrations

- She feels like there is too less communication with the youngest childs' school, and she would like more collaboration and communication with the school.
- She thinks that Aula is too monotone and depressing for children, and that it should be more colorful. She thinks that Aula's visual design is more directed towards Adults than children.
- She worries a lot about the data privacy in Aula. Since the Covid-19 situation arrised, all the parents are sending screenshots of their childrens' Covid-19 tests, which also shows all the personal information about the children. She is worried that it is shared so easily with each other in Aula without thinking about the data privacy.

https://media.istockphoto.com/photos/serious-woman-staring-intently-at-the-camera-picture-id1198037490?s=612x612

Figure 64: Persona 5.

The personas are further used in order to create scenarios describing their use of Aula, their pain points when using Aula, as well as to represent their needs and wishes regarding Aula.

7.2. Scenarios

A scenario is a brief story which describes how and why users would use a product or a service, and how they would complete specific tasks within it in a specific context. It is not required to describe the use of software or other technological support to achieve the goals or fulfill the needs of a user. Understanding why people are doing things as they do or what they are trying to achieve within the process focuses on human activity rather than interaction with technology. The main purpose of creating and using a scenario is to help the design team to visualize how a target user would interact with a product or a service in a real-life situation. Moreover, scenarios can further help to develop tasks for usability testing (Rogers, Sharp & Preece, 2019b).

We have used scenarios in order to tell stories about our user personas and their experiences with Aula, specifically the problems they have experienced within the Messages, Come/Go and Calendar function, as well as their wishes in order to improve their experience.

The following scenarios were created, and they are further used in order to test our design solution within usability testing, which is explained in the following section.

Narrative:

Imagine that you are a mother / father of two children: Louise aged 8 (2.b) and Henry aged 10 (4.a). You are quite annoyed with several things in Aula. You find the platform cumbersome to use and you believe that 80% of the information provided in Aula is redundant and some of the functions in Aula are not logical and intuitive. However, Aula has now given you an opportunity to try out some new design ideas, made with the

purpose of improving the user experience. The ideas are still in the early development phase and we therefore need your help to test them. You will now be introduced to 4 scenarios that an Aula user normally would experience. You will need to imagine that you are in these specific situations while navigating in the prototype. We will guide you along the way.

Scenario 1: Messages

Prototype 1 - Message function (reply-all)

A lot of parents (including you) have an issue with Aula receiving loads of information. The amount of information is overwhelming and it is difficult to navigate between what information that is relevant for you and your child and what information that is not. You often receive notifications saying that you have received a new message, but most of these notifications are caused by other parents who mistakenly reply to all recipients of a message thread, when the intention was to reply to the sender only. It causes you to receive an abnormal amount of redundant notifications. Aula has tried to work on it and came up with a new solution. Try out and tell us about your experiences.

Scenario 2: Come/Go

Prototype 2 - Come/Go function (notify absence in one place)

You are quite annoyed that when your child is sick or having a day off from school, you need to both inform the teachers by sending them a text via the Message function, but you also have to notify the after school center about her absence in the Come/Go function. You wish that it was possible to notify both the school and the after school center in one place instead of two. It is now an option to notify them of an absence in one place instead of two, try it out, see how it works, and tell us about your experience.

Scenario 3 - Calendar

Prototype 3 - Calendar function (notify absence using calendar)

You are travelling to London for a short trip together with your daughter Louise, and you need to notify the school and the after school center about her short holiday. Normally you would notify absence in the Come/Go function, you wish that it was possible to do that in the Calendar function. Aula has now made it possible for parents to do it, and they invite you to test the new option in the calendar. Try it out and tell us about your experience.

7.3. Usability testing

Usability testing is an evaluation method combining several methods in a controlled setting (Rogers, Sharp & Preece, 2019d). A usability test can be conducted in order to ensure that a design solution *"behaves as we expect and meets user requirements* (Dix, Finlay, Abowd, & Beale, 2004a; p. 319)*"*. According to Dix et al. (2004) *"… it is much easier to change a design in the early stages of development than in the later stages* (Dix et al., 2004a: p. 319).*"*, meaning that problems can be resolved before using time and efforts on implementation (Dix et al., 2014a).

To assess the users personal experience of the system is at least as important as to evaluate the system design in terms of its functionality. It could be aspects like how easy the system is to learn, the users overall satisfaction with the system or enjoyment when using it (Dix et al., 2004a). According to Dix et al. (2004a), evaluation of a system has three main goals*:*

1. *to assess the accessibility and extent of the system's functionality.*
2. *to assess users' experience of the interaction.*
3. *to identify any specific problems with the system.*

In order to evaluate our design solution, we have conducted a usability test combined with the Think Aloud technique. The think aloud technique is a useful method to understand what persons are thinking while testing a product (Rogers, Sharp & Preece, 2019e). Combining the two methods helped us to get an understanding of what the participants were thinking while testing and evaluating our design solution. While navigating within the prototype, the participants were encouraged to tell us their thoughts regarding the design solution. We have used scenarios to allow the test participants to imagine specific situations and the context of the problem, making it easier for them to imagine the problems in real-life settings. While they were navigating through the different steps in regards to the tasks they had to do, we asked the test participants different questions and invited them to share their thoughts and ideas with us. We did not use a specific guide with questions, but we just tried to ask as much as possible during the test sessions in order to get to know what they think about our design solution regarding the issues we are trying to solve.

According to Rogers, Preece & Sharp (2019f), the total number of users involved in a usability test regarding early research must be somewhere in between 5-12. For our research we have conducted six test sessions both remotely and physically - three sessions were conducted online and three in a physical location. Three of the test participants are Aula users, whereas the other three are not. We needed to assist the three participants that are not Aula users, in order to make sure they understood the problems we are aiming to solve and in which context the problems can occur. We have helped them to navigate through the system, but we tried to help as little as possible as we wanted the participants to figure things out themselves and not to influence them too much within the testing process. As these participants do not know how to navigate in Aula's app or the features within Aula, we showed them screenshots of the current design of the Message function as they needed to have something to compare our design solution with. When testing our solution regarding notifying absence in, respectively Come/Go and Calendar, we asked the participants where they intuitively would click in Aula in order to notify the absence. This question helped us to figure out if it, for example, was an intuitive choice to place ‘Notify sickness’ and ‘Notify holiday/Off’ in the

Calendar. If they answered that they immediately thought they should go to the calendar in order to notify them of their absence, we would ask them why they had that thought.

7.4. Test results

Within this section we are presenting and explaining the test results and the feedback received from the six test participants. As we have tested three different functions and used three prototypes, the test results are divided into the three parts: Messages, Come/Go and Calendar.

Messages

Some of the test participants were surprised about Aulas current design, that the default is set to reply to everyone within a message thread, and they feel like it is illogical regarding what they are used to in comparison to other systems. Several of the test participants mentioned that our solution reminds them of Facebook or iMessage in iOS, which made them feel very comfortable with the prototype as they already knew what they should do and had easy time navigating within the prototype due to its similarities with other systems the test participants use on a daily basis.

One of the test participants stated that she did not even know about the 'reply only the sender' option, which is the current Aula's solution to reply only to the sender and not everyone, which often causes in receiving messages that seem not to be addressed to her. She said: *"I did not even know that I can choose 'reply only the sender'. I have just never noticed it. (..) I have been thinking sometimes about some messages that I have received and they seemed very personal, and then I just thought that it is probably not for me."*

One of the test participants stated that she likes that within our design solution 'reply all' is placed in the middle of the text field and 'send' button, making it impossible to

oversee ‘reply all’ in case the message had to be sent to everyone. She stated: *“It is kind of like a “next step” after finishing writing a message. In case if I have to reply to everyone, so I would just tick off ‘reply all’ and then click on a ‘send’ button. It makes sense.”*

Overall, all of the test participants liked our design solution, and they saw it as a logical and intuitive way to fix the current issue within the Message function in Aula. When asked if our design solution is better than the current design, one of the test participants stated: *“It is surely better. It is much easier to see where to reply, and it is quite clear who you then reply to. It is nice that you can only answer one in this thread with 113 people. ”* Another test participant stated: *“This is by far a better way to reply to a message instead of the one that Aula has currently, and it would avoid parents to think too much and spend energy on ticking off or clicking other places and so on. It’s a logical solution that would definitely avoid the large amount of notifications coming in as the users would make less mistakes.”*

When asked if there is anything that we could have done differently or solved the problem in another way, one of the test participants shared her thoughts: *“So if I could change something, it could be if you were inside this thread and, for example, only wanted to answer two of them, so you could choose who you would reply to. But then, yeah, of course, you would also have many such side conversations running. (..) It might be a little crazy, but… Then of course you could just make your own thread.*" Another thing she suggests is: *“It is also very cute that the little button called ‘Mark as sensitive’. It could also be one that you could click on whether it should be for everyone or just the sender - ‘Answer Kirstine privately', 'Answer the whole thread' or something like that.”*

Summary: Overall our test participants liked our solution and they found it a logical and intuitive solution for the current issue in Messages. They believe that our solution could help to avoid that everyone ‘reply to all’, avoiding also the large amount of notifications parents are receiving caused by that. Some of the test participants stated that our design solution reminded them of other platforms such as Facebook, which increased the familiarity and helped them to navigate easier as they felt like they already knew where to click and how to use the prototype. However, there was one thing that could be taken

into consideration as one of the test participants wondered about a possibility to only reply to, for instance, two people within the thread, and there would be a possibility to make a solution for that.

Come/Go

Firstly, when asked to notify absence, one of the test participants was surprised that it is within Come/Go, because she automatically thought that she needs to do that in the calendar, even after she read the scenario. Another thing the same test participant was confused about was if she has a situation if her child is sick, as she states: *"I could not find out either, uh, so Inotify my daughter's illness today, but I did not know when she will be back to school. Should I do it every day or what?"*

One of our test participants could not find the Come/Go function and regarding that he stated: *"It is very difficult to find this function. And if it is an important function in Aula that is often used by Aula's users, then I would say that it is not very well placed currently. (..) It should be placed more visible within the "home" screen or somewhere there, but at least not where it is placed currently."*

One of the test participants was very satisfied with the fact that it is possible to notify absence for several children at once. She states: *"It is smart to be able to choose both children, because sometimes you do not have that much time in the morning and then it just has to go fast."*

Several test participants liked our design solution and they found it logical and easy to use, as well as less time consuming in comparison to the current design in Aula. Most of them think that it is not very intuitive in Aula that parents have to notify absence in two different places, and that it is strange that Aula has not improved or updated as so many parents are unsatisfied with this issue in Aula. One of the test participants states: *"It's great that you can do it this way, instead of having to write for a teacher privately."*

However, there are several things that test participants pointed out even though they thought that our design solution was logical. One of them is as one of the test participants states: *"I think that makes good sense. The only thing I think it is, do you know who you write to when it says School? So I think that you might want to be sure that it is for the class teacher or… "Such a person, so if you can kind of connect it to a person, then it just shows who it is it sends it to. (..) It would be nice if you could then choose the teachers who should receive the message, so you are 100% sure that they receive the message."* Another test participant points out: *"What if one day the teacher himself / herself is ill? So who knows that my child is sick? Because then the substitute does not know that there is a student missing. So where does it go? Is there anyone who should know that the child is ill?"*

Another test participant stated: *"It is nice to get this pop-up 'sickness is registered' after the registration is completed, so I am 100% sure that I have been notified of the absence."* However, after that she got confused: *"Where can I see the registration afterwards? Where it shows that I have registered sickness, and is there a possibility to see those registrations. Like the history of it?"*

Summary: Most of our test participants were satisfied with our solution as they think that it would be a great option to notify their children in one place instead of several, which our solution gave a possibility for. Besides that, they liked the idea of having an opportunity to notify absence for several children at once as it is more effective and less time consuming. They liked our solution and they found it to be logical and intuitive. However, one of the test participants was a little bit worried about the fact that if they were notifying absence in Come/Go, how would school get informed about it as normally they are used to writing to the teachers in order to notify their childrens' absence. Therefore she was curious about "the back-stage" of the 'school' button within our Come/Go solution. Another thing to take into consideration is the part with 'Sickness is registered' - one of the test participants particularly mentioned that she liked the pop-up that informs that she has completed the registration. However, she could not see the registration afterwards, and she was wondering if it is possible to see the registrations somewhere afterwards.

Calendar

One of the test participants thinks that it is fine to have two options to notify absence - Come/Go and Calendar. He likes the idea that it is possible to notify absence in the Calendar as it gives a better overview when planning longer holidays or so on as he feels like it is easier when he sees dates and weeks within a calendar. Absence just for one day could be easily notified either in Come/Go or Calendar.

Several test participants stated that it should be possible to click on a specific date in order to notify absence (this step we do not have in our prototype). In that way it avoids choosing a start date later within the other screens of the prototype as that would seem like an extra step for the users. Moreover, that is the way the test participants normally use any other calendars, and that would only seem logical to do the same way also in Aula. The rest of the steps within the prototype seemed very logical for most of the test participants. One of the main reasons for that was the fact that they already have tried out the Come/Go function where design of the several last screens was the same as in calendar function as problems within both functions are regarding notifying absence. The screens that test participants already have seen provided them with similarity, which helped in the process as they already know what and how to do, which shows that it is easy to learn the system and elements within it.

One of the test participants wondered: *"If it is possible to notify absence in the calendar and it works so well, why have Come/Go function at all? Maybe they should just delete the function then!?"*

Summary: One of the test participants mentioned that he likes the idea that it is possible to notify absence in two places - in Come/Go and in Calendar even though he would mostly use the Calendar for it as he likes that he can see the whole month with dates and so on when he needs to notify absence, and especially when notifying holidays for several weeks. Contrary, another test participant was wondering if the Come/Go

function is longer needed in case it would be possible to notify absence in Calendar. Overall, the test participants liked the idea, but they felt like we missed a step with a possibility to click on a specific date in order to notify an absence, and in that way they would not need to find the specific date within later steps in the process (See Figure 65 below). The rest of the steps they found were logical and intuitive.

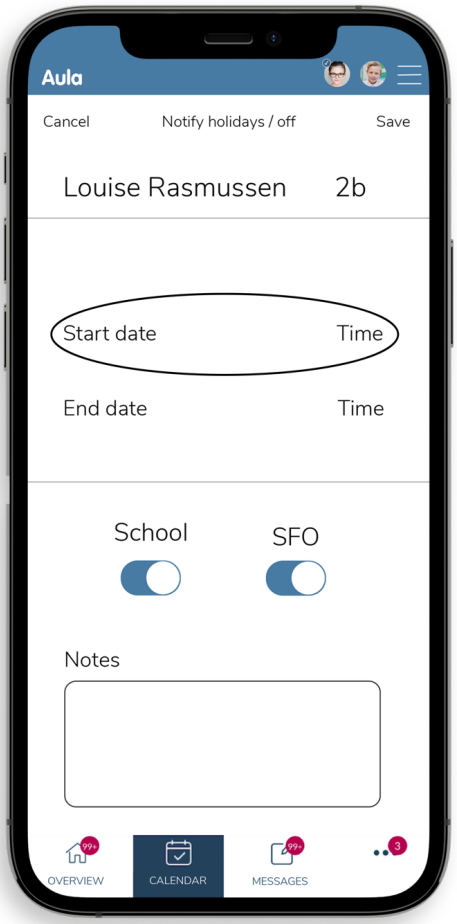

Figure 65: The black circle showing the 'Start date' within Calendar when notifying absence.

Besides all the feedback and recommendations regarding Messages, Come/Go and Calendar we received also feedback about the prototype itself.

One of the test participants stated that it is great to have an option to choose children in the header part of Aula's app. However, as he does not see so well, those profiles seemed too small for his eyes and he suggested: *"It could be designed more visible in a way. Maybe by highlighting children's profile with another color or making the selection somehow more visible, or maybe some shadow behind childrens' picture. I do not know how, but that would help me to notice the difference better."*

The feedback received within testing can be reflected upon, but not acted upon due to limitations and scope of the thesis. In the perfect scenario, the next iteration could start after the testing in order to find out how to solve the specific issues and improve the design solution based on the feedback that has been received.

8. Discussion & Conclusion

In this section we discuss the findings related to the research questions (RQ) in order to answer our problem statement (PS): *How can Aula be improved in order to better facilitate school-home communication and collaboration?* The discussion is divided into subsections, where each subsection will contribute to answering the RQs and PS. The subsections are as follows: 1. School-home communication and collaboration, 2. Parent involvement and engagement, 3. ICT for school-home communication and collaboration.

8.1. School-home communication and collaboration

According to Christenson (1995) school-home collaboration involves a two-way information exchange, and is described as individuals working toward a common goal with shared power (Christenson, Rounds, & Franklin, 1992). Regarding Aula, the Message function is, according to our data, the primary source for school-home communication. In Messages, teachers and parents can exchange information with one another on an equal level of power. The communication via Messages can, therefore, be defined as a flow of two-way information exchange, where parents and teachers are working towards a common goal, which, in this case, is to collaborate.

Can (2016) states that teachers should make an effort to be interactive when communicating with families rather than posting information without allowing some form of response or discussion. The reason is that parents see communication with teachers as interactive rather than one-sided. According to our own findings, our participants highly appreciate effective communication with the teachers. They like that it is easy to get in touch with the teachers, and they appreciate quick responses from them. In relation to this, P5 states that she would like the teachers at her daughter's school to communicate more effectively. The lack of communication has a negative effect on her collaboration, as well as satisfaction with the school. The participants, who were

satisfied with the school-home collaboration particularly emphasized on the fact that the communication with the teachers were effective, and that they appreciated that the teachers reach out and help whenever problems occur. Can (2006) also found that providing families with a platform to work together may facilitate positive relationships, and that they become more self-reliant as a group, as well as that they would receive an abundance of information than not enough information from school. Two of the interviewees mention the idea of a forum or a private page for parents to internally communicate about school related subjects. P1 mentions, for instance, that she only communicates with other parents via Facebook groups, and that Aula probably could have a similar function. She also stated that she believes that the large amount of information in Aula is the reason why she and other parents choose to communicate on Facebook instead of via the Message function in Aula. Several of our participants stated that they find the amount of information in Aula overwhelming, and that it can be difficult to dissect and navigate through the information. Sometimes they also receive information that is not targeted to them, which causes them to receive a large amount of redundant and irrelevant information.

As Natale and Lubniewski (2018) state, time factors often affect the interaction between parents and teachers, as parents typically do not have time to communicate with the school while they are at work, and teachers are inaccessible after parents are back at home from work. Such factors can interfere with the desired quality and quantity of parent-teacher interaction. P7 states that due to her work hours, she finds it difficult to participate in social schooling activities where parents are invited to join and participate in activities, such as a school run or decorating school for Christmas. P7 mentions that it can make a parent appear as a bad parent if they do not participate in such activities, and if they do not keep themselves updated in Aula. In relation to this, P4 indicates that it can give her a bad conscience, because she thinks that she should keep herself more updated on what is going on regarding her children's schooling.

8.2. Parental involvement

According to Can (2006) parents' beliefs are often influenced by teacher-parent communication. Parents benefit from well-organized teacher-led communication actions, and that the use of online platforms or mobile applications for communication purposes could increase parent involvement. According to our research, 7 out of 8 parents used Aulas app as they found the app easy and convenient to use. According to Natale and Lubniewski (2018), teachers and families are relying more on using technology to communicate effectively as technology has the ability to build connectedness between school and home since communication can be instant. According to this P6 appreciates using Aulas app, because it enables him to keep himself updated on school-related information while he is at work. Having the app makes it flexible for parents to easily check for new information regarding their children's schooling, as they typically have their phone with them most of the time. Aula's app makes school-home communication possible without time constraints.

Christenson (1995) describes parental involvement as a one-way flow of information between school and parents. Our data shows that there is a difference in how involved the individual parents wish to be in their children's schooling. Some parents have very little need for information (P4, P7), and they are also the ones who find Aula most annoying, disturbing and cumbersome to use. Both P4 and P7 mention that they do not have time to check Aula all the time. Due to their busy work life, they just want it to be easy and convenient to check up on it and to receive the information that is relevant for them. Other participants think that Aula is just fine as it is, and they did not have many requirements or expectations of the school either.

As Defur (2012) found, many parents prefer communication from the school that shows and indicates care for their child, as well as communication that shows an understanding between them and the school. According to our findings, we can also conclude that several parents emphasize that the teachers care for their children's well being and help out when problems occur. P2, P3 and P5, particularly, state that they

appreciate that the teachers indicate care for their children and that they help solve problems among the children in the classes.

8.3. ICT for school-home communication and collaboration

Aula serves its purpose as a school-home communication and collaboration platform, but in order to improve and increase the quality and effectiveness of the collaboration and communication between school and home, a number of factors need to be taken into consideration. When using ICT for school-home purposes, factors such as the commissioning of the system, play a central role in relation to the parents' experience of Aula as a facilitator for school-home communication and collaboration. Several parents mention that information in certain functions sometimes is not updated, which makes the functions unuseful to them. P5 states, for instance, that she does not use the Come/Go function, because the school does not update the information about the children's arrival at school, as well as information about when they leave school again. P6 states that the school schedule in the Calendar is not always updated either, which prevents him from being able to follow the children's schooling activities, and therefore he often contacts the school in order to follow up on his childrens' schedule or other schooling activities. According to Tatar (2009) most families stated that reciprocity is necessary when communicating through technology, and that the parents would rather receive an abundance of information rather than not enough information. According to this, our participants find that the information provided in Aula is overwhelming. The fact that they find the information overwhelming is, in this case, caused by both non-targeted information, as well as the fact that some Aula users forget to click on 'Reply sender directly'. Whether the abundance of information related to Tatar's (2009) study only concerns relevant and targeted information, but based on our data, we cannot agree that parents would rather receive an abundance of information than nothing.

Regarding the usability of Aula, P4 experiences that the Come/Go function lacks intuitivity and the name Come/Go does not resonate with the actual use of the function, as P4 states she would not intuitively go to a function called Come/Go in order to notify absence. Another issue is that it does not make sense that one has to notify absence to the after school center in Come/Go, but that you have to text the teachers in order to notify absence to the school. She also finds some of the function names misleading, as she does not feel like the name fits the actual function. In order to make it more intuitive for the users to notify absence, we have created a design solution where the user has the possibility to notify absence for both the school and the after school center in one place instead of two places.

Several of the problems our participants experience with Aula, are somehow related to the commissioning of Aula. As facilitator of school-home collaboration, Aula is somehow dependent on the commissioning. Each school must take on the full responsibility of the commissioning of the platform in order to make it possible for Aula to serve it's full purpose. Several parents experience receiving the same information twice or more when having more than one child in the same school. P5 states that she sometimes receives the same information sent out by different school staff. In order to make the information provided in Aula less overwhelming to the parents, the school staff should somehow coordinate who sends out the different information. Due to the redundant information, the information in Aula is experienced as overwhelming. Several parents state that it requires concentration to navigate through the information in Aula. The participants also mention that the difference between the information sent out in, respectively Messages and Overview, is not always clear, and it makes it difficult for parents to distinguish between the information as they often do not know where exactly to find and look for new information, when receiving a notification. *"Sometimes it can be difficult to understand if the message you have received is in Overview or in Messages, because it is like this ... yes … Sometimes it is unclear what is happening, where is it? (..)"* (P1, 1.7.a). The information sent out has a lot to do with the commissioning of Aula, as mentioned earlier. The type of information that the school staff decides to send out in, respectively Overview and Messages, is a choice they make. Some participants propose to categorise the information, especially in Overview. This would require that

the school staff categorised the information beforehand, or that the parents individually categorise the provided information on their own.

Natale and Lubniewski (2018) states that teachers often include mass-messages within their communication in order to reach the whole class. However, mass messages may have a backside. According to our data, parents experience that other parents do not always click on 'Reply sender directly' when replying to a message. For instance, when receiving messages they experience receiving messages containing private information which obviously was not intended for them *"Sometimes I also get private messages that were actually meant to be sent to the teacher. I think it's because I have very similar initials. But it's just weird that those messages can actually be sent to me and that there is a possibility of it at all. Maybe they could make it so that it is not possible for other parents to write a private message and even though I am not a teacher but a parent - that there is a possibility that it is still sent to me as a mistake."* (P5, Q17.) These non-targeted messages result in parents receiving redundant notifications and messages with information that are irrelevant to them. In order to solve this problem, we have created a design solution that forces parents to actively choose to 'reply all' instead of it being an automated action. The feature 'reply sender directly' has instead of 'reply all' been integrated as an automated action when replying to a message. By making 'Reply all' an active choice, the aim is to decrease the amount of redundant and non-targeted messages. According to Chaboudy and Jameson (2001), ICTs such as cell phones, e-mails, texts, and mass notification systems, can be used for quick communication due to the ease of use and timely nature. Mass communication systems might be an effective tool for teachers, as they typically need to reach many parents at once. When using mass communication systems, such as Messages in Aula, parents' needs and experiences should be taken into account as well. It might be effective for teachers to send out to many parents at once, but according to our data, it can result in redundant, overwhelming and non-targeted information sent out to parents. In order to avoid this the communication needs to be well organised internally among the school staff, and it should somehow be avoided that parents with more than one child at the same school receive the same information more than once. In order to improve the school-home communication and collaboration, the information provided in Aula must be targeted

and the teachers should make an effort in order to communicate effectively with the parents and they should indicate that they care about the children's well-being. The information and communication technology provided for school-home collaboration should be intuitive and easy to use, as time factors play a significant role in parents' everyday life.

8.4. Reflections

Initially, we have planned to conduct the interviews and contextual sessions, as well as all the usability tests physically, face-to-face with the participants. However, the Covid-19 situation did not fully allow us to conduct interviews, contextual inquiry and test sessions physically. During our thesis semester, it was still recommended to keep distance and try to limit close contact with other people as much as possible. That caused some issues such as bad Internet connection, when we suddenly could not hear what the interviewee was saying. Regarding the contextual inquiry, it was sometimes difficult to see what the interviewees showed us on their screen. The fact that we sometimes found it difficult to see their screens, made us compelled to find documentation for their problems on our own afterwards. It was, in some cases, difficult to identify a connection with their statements and how we experience Aula, when exploring the app ourselves. These things would be avoided if the interviews were conducted in a physical location.

When conducting the semi-structured interviews, we aimed to ask follow-up questions throughout the interviews in order to get a clear understanding of the participants' experiences. When looking through our data afterwards, we became aware that the amount of follow-up questions vary a lot from one interview session to another. In order to get more in-depth information from some of the participants, we could have added more follow-up questions to some of the interviews. We are aware that we either way cannot control how much or what the participant chooses to share, but adding more

follow-up questions could have given us a better basis for, as well as understanding of their experiences and thus the improvement of Aula.

By using meaning condensation as an analysis method, we experienced that we sometimes lost the essence of the participants' statements. It forced us to go back and forth between the affinity diagram and the transcriptions several times, in order to be sure that we understood them correctly.

8.5. Future work

There are several opportunities for improving and extending the scope of the thesis, but due to the time constraints have left them out for the future improvements, which are outlined below:

1. As Dix et al. (2004b) states, user requirements need to be captured and analysed within the context of use, as redesigning a system can affect an entire organization and its work practices. Sometimes organizational issues can affect the level of acceptance and relevance of an information and communication system. Such factors will typically exist outside the system and can play an essential role when determining the success or failure of the system. When a system has more than one stakeholder group, ignoring potential conflicting goals, systems are likely to fail (Dix et al., 2004b). We have limited our research only to one of the target groups of Aula, respectively parents, and excluded teachers and children, who also use Aula on a daily basis. It could therefore be interesting to explore other target groups of Aula and their needs regarding the system.

2. One of our interview participants (P2) mentioned an idea about a private page in Aula, where parents, children and teachers within a specific class can communicate with one another as he feels like it is missing in Aula. Moreover, another interviewee (P1) mentioned that she uses Facebook to communicate

with other parents from her childrens' classes. It could be interesting to investigate this idea further in order to figure out why parents want to discuss with each other within a specific class, and if there are many other parents who have the same need.

3. P7 mentioned that the sequence in comments/replies is illogical. In order to meet the user's needs, we would have to research exactly what the problem is as we could not identify the problem when we explored Aula's app on our own. An explanation could be that the participant only uses a website for accessing Aula, and we do not know if there are any differences in the sequence in messages depending on using the app or the website version.

4. As many interviewees stated, information in Overview and Messages is not categorised, which many users would be interested to have in Aula. It could be interesting to research this issue more and find a possible solution for it. It could be that it would require that either the teachers categorise the information before sending it out, or that the parents themselves were able to categorise the posts in e.g. Overview. We would have to research the proposals regarding categorization further in order to be able to meet their needs correctly.

5. P1 mentioned that she is a little bit annoyed that it is not possible to send out messages directly from 'My Groups'. It could be interesting to research this option more in depth in order to find out if there could be a possibility to find a possible solution for allowing users to send messages using 'My Groups'.

6. As several interviewees mention, the information in Messages and Overview is not distinguished, which causes frustration for many parents as they do not know where to look for certain information after they have received a notification. It could be interesting to research this issue more in depth in order to try to find a possible solution for it.

9. References

Adams, K. S., & Christenson, S. L. (2000). Trust and the family–school relationship examination of parent–teacher differences in elementary and secondary grades. Journal of School Psychology, 38(5), 477–497. doi:10.1016/S0022-4405(00)00048-0

Akselvoll, M. Ø. (2015). Det digitaliserede skole-hjem samarbejde i et forældreperspektiv: - om forældres forskellige involveringsstrategier på Forældreintra. Dansk Pædagogisk Tidsskrift, 2015(4), 25-33. [3].

Akselvoll, M. Ø. (2016). Folkeskole, forældre, forskelle: Skole-hjem-samarbejde og forældreinvolvering i et forældreperspektiv. Roskilde Universitet. Afhandlinger fra Ph.d.-programmet i Hverdagslivets Socialpsykologi

Akselvoll, M. Ø. (2018). *"Så kommer de andre med deres fine retter og så står jeg bare der med den dumme pizza"*: Symbolske grænser i det sociale liv i folkeskolen. Norsk Sosiologisk Tidsskrift, 2(3), 225-241. https://doi.org/10.18261/issn.2535-2512-2018-03-03

Arnold, D. H., Zeljo, A., Doctoroff, G. L., & Ortiz, C. (2008). Parent involvement in preschool: Predictors and the relation of involvement to preliteracy development. School Psychology Review, 37(1), 74–90.

Aula. (n.d.-a). *Udvikling af Aula.* Aulainfo.dk. Retrieved from: https://aulainfo.dk/guide-til-projektledere/funktionalitet-i-aula/status-paa-nye-funktionaliteter/

Aula. (n.d.-b). *Aulas prioriteringsmodel*. Aulainfo.dk. Retrieved from: https://aulainfo.dk/om-aula/aulas-prioriteringsmodel/

Aula. (n.d.-c). *Baggrunden for Aula.* Aulainfo.dk. Retrieved from: https://aulainfo.dk/guide-til-foraeldre-og-elever/baggrunden-for-aula/

Aula. (n.d.-d). *Aulas Mission*. Aulainfo.dk. Retrieved from: https://aulainfo.dk/om-aula/aulas_mission/

Bandura, A. (1997). Self-efficacy: The exercise of control. New York, NY: W. H. Freeman.

Baruah, J., & Paulus, P. B. (2016). The role of time and category relatedness in electronic brainstorming. Small Group Research, 47(3), 333–342.

Bauch, J., & Phillips, B. (1991). The transparent school model. Paper presented at the 12th E.C.O.O. and 8th I.C.T.E. Joint Conference Emerging Partnerships. Nashville, TN.

Berklan, S., & Hughes, T. R. (2020). Is innovation outpacing insight: Why schools need policy to address communication practices with parents. eJournal of Education Policy, 21(1). https://doi.org/10.37803/ejepS2010

Bordens, K. S., & Abbott, B. B. (2011). Chapter 7: Understanding Ethical Issues in the Research Process. In Research Design and Methods: A process approach. Boston, MA: McGraw-Hill, 193-218.

Bryk, A., & Schneider, B. (2003). Trust in schools: A core resource for reform. *Educational Leadership, 60*(6), 40-45.

Bryman, A. (2012a). Chapter 18: Sampling in qualitative research. In Social Research Methods (4th ed.). New York: Oxford University Press, 416-429.

Bryman, A. (2012b). Chapter 20: Interviewing in qualitative research. In Social Research Methods (4th ed.). New York: Oxford University Press, pp. 468-499.

Bryman, A. (2012c). Chapter 9: Structured interviewing. In Social Research Methods (4th ed.). New York: Oxford University Press, pp. 208-230.

Bryman, A. (2012d). Chapter 11: Asking questions. In Social Research Methods (4th ed.). New York: Oxford University Press, pp. 246-267.

Bryman, A. (2012e). Chapter 3: Research designs. In Social Research Methods (4th ed.). New York: Oxford University Press, pp. 39-72.

Bryman, A. (2012f). Chapter 6: Ethics and politics. In Social Research Methods (4th ed.). New York: Oxford University Press, pp. 129-154.

Bryman, A. (2012g). Chapter 17: The nature of qualitative research. In Social Research Methods (4th ed.). New York: Oxford University Press, pp. 373-406.

Bushnell, M. (2020). What Is the Difference Between an App and a Mobile Website?. Retrieved 13 June 2021, from https://www.businessnewsdaily.com/6783-mobile-website-vs-mobile-app.html

Buxton, B. (2007). *Sketching User Experiences: Getting the Design Right and the Right Design*. 1. ed.
Morgan Kaufmann, Amsterdam.

Byron, T. (2009). *The 'Oh, Nothing Much' Report: The Value of After-School Conversation*. Becta, Coventry. Retrieved from: https://mirandanet.ac.uk/wp-content/uploads/2019/06/after_school_conversation.pdf

Bæck, U. D. K. (2010). Parental involvement practices in formalized home-school cooperation. *Scandinavian Journal of Educational Research, 54*(6), 549–563.

Cameron, A., & Lee, K. (1997). Bridging the Gap Between Home and School With Voice-Mail Technology. The Journal Of Educational Research, 90(3), 182-190. doi: 10.1080/00220671.1997.10543775

Can, M. H. (2016). Use of mobile application: Means of communication between parents and class teacher. *World Journal on Educational Technology: Current Issues*, *8*(3), 252-257.

Carroll, J. M. (2000). Introduction to the Special Issue on Scenario-Based Systems Development, Interacting with Computers, 13(1), 41–42.

Cary, A. O. (2006). *How strong communication contributes to student and school success: Parent and family involvement.* Rockville, MD: The National School Public Relations Association.

Chaboudy, R., & Jameson, P. (2001). Connecting families and schools through technology. *The Book Re- port, 20*(2), 52-57.

Christenson, S. L. (1995). Families and schools: What is the role of the school psychologist? School Psychology Quarterly, 10(2), 118-132.

Christenson, S. L., Rounds, T., & Franklin, M. J. (1992). Home-school collaboration: Effects, issues, and opportunities. In S. L. Christenson & J. C. Conoley (Eds.), Home-school collaboration: Enhancing children's academic and social competence (pp. 193-214). Washington, DC: National Association of School Psychologists.

Cohen, L. (1988). Quality function deployment: An application perspective from digital equipment
corporation. National Productivity 7(3). 197-208.

Constantino, S. (2003). Engaging all families: Creating a positive school culture by putting research into practice. Oxford, UK: Rowman & Littlefield Education.

Coughlan, M., Cronin, P., & Ryan, F. (2007). Step-by-step guide to critiquing research. Part 1: quantitative research. Br J Nurs 16(11): 658–663.

Coughlan, P., Suri, J., & Canales, K. (2007). Prototypes as (Design) Tools for Behavioral and Organizational Change. *The Journal Of Applied Behavioral Science*, *43*(1), 122-134. doi: 10.1177/0021886306297722

Cronin, P., Ryan, F., & Coughlan, M. (2008). Undertaking A Literature Review: A Step-By-Step Approach. British Journal of Nursing, 17(1), 38-43.

Currie-Rubin, R., & Smith, S. J. (2014). Understanding the roles of families in virtual learning. *Teaching Exceptional Children*, *46*(5), 117-126.

Dagenais, C., Pinard, R., St-Pierre, M., Briand-Lamarche, M., Cantave, A. K., & Péladeau, N. (2015). Using concept mapping to identify conditions that foster knowledge translation from the perspective of school practitioners. *Research Evaluation*, *25*(1), 70-78. doi:10.1093/reseval/rvv026

Dandanell, N. (2019). *Kritik: Aula indeholder alvorlig sikkerhedsbrist*. Skoleliv.dk. Retrieved 4 February 2021 from: https://skoleliv.dk/nyheder/art7506098/Aula-indeholder-alvorlig-sikkerhedsbrist

Davies, D. (1996). Partnerships for student success. *New Schools, New Communities, 12*(3), 13–21.

DeFur, S. (2012). Parents as collaborators: Building partnerships with school and community based providers. *Teaching Exceptional Children, 44*(3), 58-67.

Desforges, C. (2003). The impact of parental involvement, parental support and family education on pupil achievements and adjustment: a literature review. DfES. (Research report no. 433).

Dix, A., Finlay, J., Abowd, G. D., & Beale, R. (2004a). Chapter 9: Evaluation techniques. In *Human-computer interaction* (3rd ed.) Harlow: Pearson Education. Pp. 318-364.

Dix, A., Finlay, J., Abowd, G. D. & Beale, R. (2004b). Chapter 13: Socio-organizational issues and stakeholder requirements. In *Human-computer interaction* (3rd ed.) Harlow: Pearson Education. Pp. 450-475.

Dorst, K. (2011). The core of 'design thinking' and its application. *Design Studies*, *32*(6), 521-532. doi: 10.1016/j.destud.2011.07.006

Driessen, G., Smit, F., & Sleegers, P. (2005). Parental involvement and educational achievement. *British Educational Research Journal, 31*(4), 509-532.

Duckworth, K. (2008). The influence of context on attainment in primary school: interactions between children, family and school contexts. Centre for Research on the Wider Benefits of Learning Research Report 28.

Epstein, J. L. (2009). School, family, and community partnerships: Your handbook for action (3rd ed.). Thousand Oaks, CA: Corwin Press.

Epstein, J. L., Sanders, M. G., Simon, B. S., Salinas, K. C., Jansorn, N. R., & Van Voorhis, F. L. (2002). School, family, and community partnerships. Thousand Oaks, CA: Sage.

Facer, K. & Kent, N. (2004). Different worlds? A comparison of young people's home and school ICT use. *Journal of Computer Assisted Learning* 20, 440–455.

Fantechi, A., Gnesi, S., Lami, G., & Maccari, A. (2003). Applications of linguistic techniques for use case analysis. Springer-Verlag London Limited. Requirements Eng (2003) 8: 161-170. DOI: 10.1007/s00766-003-0174-0

Fantuzzo, J., McWayne, C., Perry, M. A., & Childs, S. (2004). Multiple dimensions of family involvement and their relations to behavioral and learning competencies for urban, low-income children. School Psychology Review, 33(4), 467–480.

Field, A., & Hole, G. (2003). Chapters 3, 4. In A. Field, & G. Hole, How to Design and Report Experiments. Sage Publications. pp. 54-140.

Flessa, J. (2008). Parental involvement: What counts, who counts it, and does it help? *Education Canada, 48*(2), 18-21.

Flynn, G., & Nolan, B. (2008). What do school principals think about current school family relationships? National Association of Secondary School Principals, 92, 173-190.

Friess, E. (2015). Personas in heuristic evaluation: An exploratory study. IEEE Transactions on Professional Communication, 58(02), 176-191.

Gogus, A. (2012). Brainstorming and learning Encyclopedia of the sciences of learning. Springer. 484–488.

Goodall, J. S. (2016). Technology and school-home communication. International Journal of Pedagogies and Learning, 11(2), 118–131. doi: 10.1080/22040552.2016.1227252

Goodman-Deane, J., Mieczakowski, A. , Johnson, D., Goldhaber, T., & Clarkson, P. J. (2016). The impact of communication technologies on life and relationship satisfaction. Computers in Human Behavior, 57, pp. 219-229.

Goldkuhl, G. (2012). Pragmatism vs interpretivism in qualitative information systems research. *European Journal of Information Systems Research*, 21. 136-139.

Govender, R. (2015). 5 reasons why peer review matters. Retrieved 21 March 2021, from https://www.elsevier.com/reviewers-update/story/career-tips-and-advice/5-reasons-why-peer-review-matters

Grant, L. (2009). Children's Role in Home-School Relationships and the Role of Digital Technologies. Futurelab, Bristol.

Greenwood, G. E., & Hickman, C. W. (1991). Research and practice in parent involvement: Implications for teacher education. *The Elementary School Journal, 91*(3), 279–288.

Grunig, J. E., & Grunig, L. A. (1992). Models of public relations and communication. In J. E. Grunig (Ed.), *Excellence in public relations and communication management* (pp 285-325). Hillsdale, NJ: Lawrence Erlbaum Associates.

Gu, L. (2017). Using school websites for home–school communication and parental involvement?. *Nordic Journal Of Studies In Educational Policy*, *3*(2), 133-143. doi: 10.1080/20020317.2017.1338498

Hagel, J. & Brown, J. S. (2005). From Push to Pull: Emerging Models of Mobilizing Resources. Working Paper. Available from: http://johnhagel.com/paper_pushpull.pdf.

Hall, E., Wall, K., Higgins, S., Stephens, L., Pooley, I., & Welham, J. (2005). Learning to learn with parents: Lessons from two research projects. Improving Schools, 8, 179-191.

Hanington, B. (2012). Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions. Rockport Publishers, Beverly.

Harris, A., & Goodall, J. (2008). Do parents know they matter? Engaging all parents in learning. Educational Research, 50(3), 277–289. doi:10.1080/00131880802309424

Hart, C. (1998). Doing a Literature Review. Sage Publications, London.

Hartshore, R., Friedman, A., Algozzine, B., & Kaur, D. (2008). Analysis of elementary school websites. Educational Technology & Society, 11(1), 291–303.

Hayes, H. (2011). Predicting parental home and school involvement in high school African American adolescents. *The High School Journal*, *94*(4), 154-166.

Heath, D., Maghrabi, R., & Carr, N. (2015). Implications of information and communication technologies (ICT) for school-home communication. Journal of Information Technology Education: Research, 14, 363-396. Retrieved from: http://www.jite.org/documents/Vol14/JITEv14ResearchP363-395Heath1876.pdf

Henderson, A. T., & Mapp, K. (2002). *A new wave of evidence: The impact of school, family and communi- ty connections on student achievement.* Austin, TX: Southwest Educational Development Laboratory. Retrieved from: https://www.sedl.org/connections/resources/evidence.pdf

Henningsen, D. D., & Henningsen, M. L. M. (2013). Generating ideas about the uses of brainstorming: Reconsidering the losses and gains of brainstorming groups relative to nominal groups. Southern Communication Journal, 78(1), 42–55.

Ho, E. S. (2009). Educational leadership for parental involvement in an Asian context: Insights from Bourdieu's theory of practice. *The School Community Journal, 19*(2), 101–122.

Holderfield, G. (2017). Generating How Might We (HMW) Questions from Insights - Using Design Principles to Innovate and Find Opportunities. Retrieved June 14, 2021, from https://www.coursera.org/lecture/leadership-design-innovation/generating-how-might-we-hmw-questions-from-insights-JMRYd

Hollingworth, S., Allen, K., Kuyok, K. A., Mansaray, A., & Page, A. (2009). An Exploration of Parents' Engagement with Their Children's Learning Involving Technologies and the Impact of This in Their Family Learning Experiences. Becta, Coventry.

Holtzblatt, K., & Beyer, H. (2016a). Contextual design. (2nd ed.) Cambridge: Elsevier. p. 43-105.

Holtzblatt, K., & Beyer, H. (2016b). *Contextual design.* (2nd ed.). Cambridge: Elsevier. p. 127 - 143.

Hornby, G., & Lafaele, R. (2011). "Barriers to Parental Involvement in Education: An Explanatory Model." Educational Review 63 (1): 37–52. doi:10.1080/00131911.2010.488049.

Idoughi, D., Seffah, A., & Kolski, C. (2012). Adding user experience into the interactive service design loop: a persona-based approach. *Behaviour & Information Technology*, *31*(3), 287-303. doi: 10.1080/0144929x.2011.563799

Implementering af Aula. (n.d.). Retrieved 23 May 2021 from: https://www.kl.dk/kommunale-opgaver/boern-og-unge/brugerportalsinitiativet/aula/implementeringen-af-aula/

Implementering af Aula. (2018). Retrieved 25 May 2021 from: https://privateskoler.dk/artany/13-siteindhold/nyheder/2544-implementering-af-aula

Interaction Design Foundation. (n.d.). User Experience (UX) Design. Retrieved 24 May 2021 from: https://www.interaction-design.org/literature/topics/ux-design

Jammerbugt Kommune. (n.d.). *Skole- og Dagtilbuds IT-platform*. Aula. Retrieved 3 February 2021 from: https://jammerbugt-kommune.aula.dk/aula

Jensen, D. A. (2007). Using classroom newsletters as a vehicle for examining home-school connections. Teaching Education, 18(2), 167–178. doi:10.1080/10476210701325283

Joshi, A., Eberly, J., & Konzal, J. (2005). Dialogue across cultures: Teachers' perceptions about communication with diverse families. *Multicultural Education, 13*(2), 11-15.

Kent, M. L., & Taylor, M. (2002). Toward a dialogic theory of public relations. *Public Relations Review, 28*(1), 21-37.

Kerawalla, L., & Crook, C. (2002). Children's computer use at home and at school: context and continuity. *British Educational Research Journal* 28, 751–771.

Kirsh, D. (2010). Thinking with External Representations. *AI Soc.*, 25(4):441–454. doi: 10.1007/s00146-010-0272-8

KL. (n.d-.a). Om Brugerportalsinitiativet. Retrieved 20 June 2021 from: https://www.kl.dk/kommunale-opgaver/boern-og-unge/brugerportalsinitiativet/om-brugerportalsinitiativet/

Kolko, J. (2010). Abductive thinking and sensemaking: The drivers of design synthesis. Design Issues, 26(1), 15-28.

Kolko, J. (2011). Exposing the magic of design : a practitioner' s guide to the methods and theory of synthesis. Oxford University Press.
Kosaretskii, S. G., & Chernyshova, D. V. (2013). Electronic communication between the school and the home. *Russian Education and Society*, *55*(10), 81-89.

Koskinen, I., & Battarbee, K. (2003). Introduction to user experience and empathic design. In: I. Koskinen, K. Battarbee, and T. Mattelmäki, eds. Empathic design, user experience in product design. Helsinki: IT Press, 37–50.

Koskinen, I., Zimmerman, J., Binder, T., Redström, J., & Wensveen, S. (2011). Design Research Through Practice: From the Lab, Field, and Showroom. Morgan Kaufmann, San Francisco.

Kouprie, M., & Visser, F. (2009). A framework for empathy in design: stepping into and out of the user's life. Journal Of Engineering Design, 20(5), 437-448. doi: 10.1080/09544820902875033

Kraft, M.A. (2017). Engaging parents as partners in education through better communication. *Educational Leadership, 75*(1), 58-62.

Kraft, M. A., & Rogers, T. (2015). The underutilized potential of teacher-to-parent communication: Evidence from a field experiment. *Economics of Education Review, 47*, 49–63.

Kuniavsky, M., Goodman, E., & Moed, A. (2012a). Chapter 17 - research into action: Representing insights as deliverables (2nd edition. ed.).

Kuniavsky, M., Goodman, E., & Moed, A. (2012b). Observing the user experience: a practitioner's guide for user research. In (p. 327-376). Elsevier.

Kvale, S., & Brinkmann, S. (2015a). Chapter 3: Epistemological Issues of Interviewing. In: Interviews: Learning the Craft of Qualitative Interviewing. (Pp. 55-83). Sage Publications, inc.

Kvale, S., & Brinkmann, S. (2015b). Chapter 10: Transskription af interview. In: *Interview. Det kvalitative forskningsinterview som håndværk.* (pp. 235-243). Hans Reitzels Forlag, København.

Kvale, S., & Brinkmann, S. (2015c). Chapter 15: Den sociale konstruktion af validitet. In: Interview. Det kvalitative forskningsinterview som håndværk. (pp. 313-337). Hans Reitzels Forlag, København.

Kvale, S., & Brinkmann, S. (2015d). Chapter 12: Interviewanalyser med fokus på mening. In: *Interview. Det kvalitative forskningsinterview som håndværk.* (pp. 267-282). Hans Reitzels Forlag, København.

Lazarus, L., & Lipper, W. (2005). Measuring digital opportunity for America's children: Where we stand and where we go from here. Santa Monica, CA: The Children's Partnership.

Lee, J., & Bowen, N. K. (2006). Parental involvement, cultural capital, and the achievement gap among elementary school children. *American Educational Research Journal, 43*(2), 193–218.

Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). Social media and mobile internet use among teens and young adults. *Pew Research Center.*

Lim, Y., Stolterman, E., & Tenenberg, J. (2008). The anatomy of prototypes. *ACM Transactions On Computer-Human Interaction*, *15*(2), 1-27. doi: 10.1145/1375761.1375762

Luchs, M. G., Swan, S., & Griffin, A. (2015). *Design Thinking : New Product Development Essentials from the PDMA*, John Wiley & Sons, Incorporated.

Lucidchart. (n.d.). Online Diagram Software & Visual Solution.Retrieved 28 July 2021, from https://www.lucidchart.com/

Luić, L., & Glumac, D. (2009). The role of ICT technology in the knowledge society. 2009 9th International Conference on Telecommunication in Modern Satellite, Cable, and Broadcasting Services. Published. https://doi.org/10.1109/telsks.2009.5339515

Lunts, E. (2003). Parent involvement in children's education: Connecting family and schools by using telecommunications technologies. Meridian: A Middle School Computer Technologies Journal, 6, 1-25.

Machen, S. S., Wilson, J. D., & Notar, C. E. (2005). Parental involvement in the classroom. *Journal of Instructional Psychology, 32*(1), 13-16.

Marvel. (n.d.). The design platform for digital products. Get started for free. Retrieved 26 July 2021, from https://marvelapp.com

Mayhew, D.J. (1999). The Usability Engineering Lifecycle: A Practitioner's Guide to User Interface Design. Morgan Kaufmann, San Francisco.

Melhuish, E., Phan, M.B., Sylva, K., Sammons, P., Siraj Blatchford, I., & Taggart, B. (2008). Effects of the home learning environment and preschool center experience upon literacy and numeracy development in early primary school. *Journal of Social Issues* 64, 95–114.

Miaskiewicz, T., & Kozar, K. A. (2011): *Personas and user-centered design: How can personas benefit product design processes?*. In Design Studies, 32 (5) pp. 417-430.

Miller, L. E. (2009). Evidence-based instruction: a classroom experiment comparing nominal and brainstorming groups. Organization Management Journal, 6(4), 229–238.

Ministeriet for Børn, Unge og Ligestilling. (2016). *Folkeskolen bygger pa˚samarbejde.*

Ministry of Children and Education. (2018). About the Folkeskole. Retrieved from: *https://eng.uvm.dk/primary-and-lower-secondary-education/the-folkeskole/about-the-folkeskole*

Ministry of Higher Education and Science. (2014). Danish Code of Conduct for Research Integrity. https://doi.org/10.1258/135581907781543085

Morville, P., & Rosenfeld, L. (2006). *Information architecture for the World Wide Web* (3rd ed., pp. 307-313). Sebastopol, Calif.: O'Reilly.

Murphy, T. (2013). An evaluation of home-school partnership relations developed in designated disadvantaged (DEIS) post-primary schools to enhance students' literacy and numeracy. DEd Thesis. Retrieved from: http://doras.dcu.ie/19370/

Natale, K., & Lubniewski, K. (2018). Use of Communication and Technology among Educational Professionals and Families. International Electronic Journal Of Elementary Education, 10(3), 377-384. doi: 10.26822/iejee.2018336196

Nielsen, L. (2004). Engaging Personas and Narrative Scenarios. PhD Series, vol. 17. Samfundslitteratur, Copenhagen, pp. 1 - 13.

Norman, D. & Nielsen, J. (n.d.). The Definition of User Experience (UX). NN/g Nielsen Norman Group. Retrieved from: https://www.nngroup.com/articles/definition-user-experience/

Nwogbaga, D. E., Nwankwo, O. U., & Onwa, D. O. (2015). Avoiding school management conflicts and crises through formal communication. *Journal of Education and Practice*, *6*(4), 33-36.

Olmstead, C. (2013). Using Technology to Increase Parent Involvement in Schools. *Techtrends*, *57*(6), 28-37. doi: 10.1007/s11528-013-0699-0

Osborn, A. F. (1957). Applied imagination. New York: Scribner.

Parajuli, J. (2007). A content analysis of selected government web sites: A case study of Nepal. The Electronic Journal of E-Government, 5(1), 87–94.

Patel, K. (2020). 5 tips to make ideation sketching approachable to all. Retrieved 18 July 2021, from https://uxdesign.cc/5-tips-to-make-ideation-sketching-approachable-to-all-9a9a23d2cdf2

Pearson, J., & Pearson, A. (2007). Determining the importance of key criteria in web usability. Management Research News, 30, 816–828. doi:10.1108/01409170710832250

Peavey, E., Zoss, J., & Watkins, N. (2012). Simulation and Mock-Up Research Methods to Enhance Design Decision Making. *HERD: Health Environments Research & Design Journal*, *5*(3), 133-144. doi: 10.1177/193758671200500313

Ramirez, F. (2001). Technology and parental involvement. The Clearing House, 75(1), 30-31.

Raven, M. E., & Flanders, A. (1996). Using Contextual Inquiry to Learn about your Audiences. ACMSIGDOC. Asterisk Journal of Computer Documentation. (p. 1-13).

Reay, D. (2005). *"Doing the Dirty Work of Social Class? Mothers' Work in Support of Their Children's Schooling."* The Sociological Review 53. 104–115. doi:10.1111/j.1467-954X.2005.00575.x.

Riise, A. B. (2020). Kun hver fjerde forælder foretrækker Aula fremfor Forældreintra. Folkeskolen.dk. Retrieved 3 May 2021 from: https://www.folkeskolen.dk/1841159/kun-hver-fjerde-foraeldre-foretraekker-aula-frem-for-foraeldreintra

Rogers, E. M. (2003). *Diffusion of innovation* (5th ed.). New York: Free Press.

Rogers, Y., Sharp, H., & Preece, J. (2019a). Chapter 1: What is Interaction Design? In: *Interaction Design* (5ft ed., pp. 1-34). Wiley.

Rogers, Y., Sharp, H., & Preece, J. (2019b). Chapter 11: Discovering requirements. In: *Interaction Design* (5ft ed., pp. 385-415). Wiley.

Rogers, Y., Sharp, H., & Preece, J. (2019c). Chapter 12: Design, prototyping and construction. In: *Interaction Design* (5ft ed., pp. 422-434). Wiley.

Rogers, Y., Sharp, H., & Preece, J. (2019d). Chapter 14: Introducing Evaluation. In: *Interaction Design* (5ft ed., pp. 495-521). Wiley.

Rogers, Y., Sharp, H., & Preece, J. (2019e). Chapter 8: Data Gathering. In: *Interaction Design* (5ft ed., pp. 296-298). Wiley.

Rogers, Y., Sharp, H., & Preece, J. (2019f). Chapter 15: Evaluation Studies: From controlled to natural settings. In: *Interaction Design* (5ft ed., pp. 523-532). Wiley.

Schlosser, R. W., Wendt, O., Bhavani, S., & Chiwetalu, N. B. (2006). Use of information seeking strategies for developing systematic reviews and engaging in evidence based practice: the application of traditional and comprehensive Pearl Growing. A review. In International Journal of Language & Communication Disorders, 41(5), p. 567-582.

Selwyn, N., Banaji S., Hadjithoma-Garstka, C., & Clark, W. (2011). "Providing a Platform for Parents? Exploring the Nature of Parental Engagement with School Learning Platforms." Journal of Computer Assisted Learning 27 (4): 314–323. doi:10.1111/j.1365-2729.2011.00428.x.

Sharma, S., & Sharma, R. (2014). Effective communication. *Scholarly Research Journal for Interdisciplinary Studies*, *3*(17), 3151-3156.

Shklovski, I., Kraut, R., & Rainie, L. (2004). The Internet and social participation: Contrasting cross-sectional and longitudinal Analyses. *Journal of Computer-Mediated Communication, 10(1)*.

Siemon, D., Becker, F., & Robra-Bissantz, S. (2018). How Might We? From Design Challenges to Business Innovation. 4. 96-110.

Tatar, M. (2009). Teachers turning for help to school counsellors and colleagues: Toward a mapping of relevant predictors. British Journal of Guidance & Counselling, 37(2), 107-127. doi:10.1080/03069880902728564

Test, D., Cooke, N., Weiss, A., Heward, W., & Heron, T. (2010). A Home-School Communication System for Special Education. *The Pointer*, *30*(4), 4-7. doi: 10.1080/05544246.1986.9944727

The Folkeskole Act, 1396 LBK §1 (2020). Retrieved from: https://www.retsinformation.dk/eli/lta/2020/1396

Thompson, B. C., Mazer, J. P., & Flood Grady, E. (2015). The changing nature of parent–teacher communication: Mode selection in the smartphone era. Communication Education, 64, 187–207. doi:10.1080/03634523.2015.1014382

Thorsøe, L., Hagelskjær, R., & Lichscheidt, E. (2019). Aula rulles ud på landets skoler: 'Er man vant til Facebook, kan man også bruge Aula'. Retrieved 4 May 2021 from: https://www.dr.dk/nyheder/regionale/oestjylland/aula-rulles-ud-paa-landets-skoler-er-man-vant-til-facebook-kan-man

Tversky, B. (2014). Visualizing Thought. In W. Huang, ed., *Handbook of Human Centric Visualization*, pp.3–40. Springer, NewYork. doi:10.1007/978-1-4614-7485-21.

Unin, N., & Bearing, P. (2016). Brainstorming as a way to approach student-centered learning in the esl classroom. Procedia-Social and Behavioral Sciences, 224, 605–612.

Valkenburg, P. M., & Peter, J. (2007). Online communication and adolescent well-being: Testing the stimulation versus the displacement hypothesis. *Journal of Computer-Mediated Communication, 12,* 1169-1182.

Vejledning i komme/gå. (n.d.). [Ebook]. Retrieved from https://resenbro.aula.dk/sites/resenbro.aula.dk/files/arkiv/Download_filer/Forældrevejledning%20til%20komme%20gå%20i%20Aula.pdf

Vuillemot, R., & Boy, J. (2018). Structuring Visualization Mock-Ups at the Graphical Level by Dividing the Display Space. *IEEE Transactions On Visualization And Computer Graphics*, *24*(1), 424-434. doi: 10.1109/tvcg.2017.2743998

Whitten, J. L., & Bentley, L. D. (2007). Chapter 7: Modeling System Requirements With Use Cases. In *Introduction to System Analysis and Design* (7th ed., pp. 244-261). McGraw Hill Irwin.

Wiseman, A. (2010). Family involvement in four voices: Administrator, teacher, students, and community members. *Penn GSE Perspectives on Urban Education, 7*(1), 115-124.

Wright, D. K. (2001). *The magic communication machine: examining the Internet's impact on public relations, journalism, and the public.*

Yumurtachi, O. (2017). A re-evaluation of mobile communication technology: A theoretical approach for technology evaluation in contemporary digital learning. *Turkish Online Journal of Distance Education*, *18*(1), 213-223.

10. Appendix

Appendix list:

- Appendix 1 - Literature approval
- Appendix 2 - A&B Analysis
- Appendix 3 - Sitemap
- Appendix 4 - Search log
- Appendix 5 - Initial draft of the interview
- Appendix 6 - Interview guide
- Appendix 7 - Consent form
- Appendix 8 - Interview transcripts
- Appendix 9 - Meaning condensation
- Appendix 10 - Affinity diagram