CHALMERS
UNIVERSITY OF TECHNOLOGY

Designing a Digital Platform for Sharing Resources

Master's thesis in Interaction Design and Technologies

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Department of Applied Information Technology
CHALMERS UNIVERSITY OF TECHNOLOGY
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Abstract

Digital sharing platforms have become popular in the past years. They allow their users to share anything they want, such as hobby equipment, transportation and other resources. In this context, sharing can be defined in different ways, for example selling and buying, renting, borrowing or giving. Popular platforms are for example, Airbnb, Uber and Blocket. This thesis explores the subject of designing these kind of platforms in order to identify challenges that might be encountered along the way. For the project work a case study of a platform called Tvättstugetid was used, which is a digital platform for people living in apartment buildings to book slots for their laundry facilities. The results were divided into a theoretical part where challenges were identified and discussed and a practical part where a prototype of the mobile layout for Tvättstugetid was designed, implemented and evaluated.

During the case study problems and issues that arose were noted. These issues were grouped together and compared to other platforms. The identified challenges were *access*, *coordination and tracking booked slots*, *privacy*, *communication* and *hierarchy of users*. Further work will be needed to validate the results with an in-depth investigation of a wider range of platforms over longer period of time.

Keywords: Sharing resources, Digital platforms, Mobile application, Digital calendar, Booking system, Interaction design, Design challenges.

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1

Introduction

In the last few years, the *sharing economy* [1] has been a growing trend. This can be seen in the various platforms for sharing different kinds of resources emerging everywhere, such as Airbnb, Uber and more. Sharing can provide economical, societal and environmental benefits which is a big factor of its appeal [2]. Popular press has reflected on the phenomenon, such as an article by Ozoda Muminova in the Guardian [3] where she identified the collaborative economy as one of the top 10 trends in 2014 and pointed out the importance of companies understanding their role in this upcoming trend. People have been sharing resources for a long time, for example shared laundry rooms in apartment buildings and public transportation. However, new technology is enabling new possibilities. Digital platforms are designed to provide an easier access to tools that support this kind of interaction between multiple users. Furthermore, platforms such as *collaborativeconsumption.com* and *smartakartan.se* act as a medium that enable their users to locate the kind of service they need. In his article Bryan Walsh, [4] describes the social benefits of collaborative consumption. According to Walsh it enables people to get to know people in their neighborhood and form relationships that are meaningful with them.

The results of a study by Hamari et al. [5] indicated that various factors motivate people to participate in collaborative consumption such as sustainability, economical factors and enjoyment of the activity. However, they further concluded that even though people often view the sustainability factor positively it does not necessarily mean that they translate that into action. Meaning that enjoyment and economical factors are more likely to be the reason for the participation.

1.1 Purpose

The purpose of the thesis is to investigate the challenges that may arise when designing a platform that enables multiple users to share resources, such as laundry rooms, bike rentals and so on. When finding a project for this thesis, contact was made with a company called Republic. They provided the opportunity to work with one of their products, a web application called *Tvättstugetid*. Tvättstugetid

is a digital booking system for laundry room appointments in apartment buildings. When finding a focus for this thesis different topics were considered. One of the thoughts was how Tvättstugetid is a type of platform for sharing resources and after further investigation it was decided to research these type of platforms in general while using Tvättstugetid as a case study for a specific platform.

1.2 Research Question

When people want to share resources it means that multiple users have the same goal, they want to assign themselves a time slot where they can use said resource. When designing a platform to enable users to achieve this goal many questions arise. What is their incentive to use this platform and where will they be using it? What exactly do they want to do and how should they do it? Are there any limitations or rules about how and when they use the service? Do they need to verify themselves before being able to book the service? How can other users be trusted? Who is responsible if something breaks? These are some of the questions that the thesis will aim to answer as well as the research question:

What challenges might arise when designing a digital platform for multiple users to share resources?

1.3 Expected Results

The expected results are divided into two parts. The first part is a theoretical part identifying challenges that might arise when designing this type of platform and a discussion of how they affect the designing platform. The second part is a working prototype of a cross-platform web application made with JavaScript, HTML, CSS and PHP.

1.4 Ethical Issues

Some thoughts on ethical issues that might arise during the designing process were noted when the project was being defined. The designing of a platform for multiple users raises the issue of how much personal information should be shared between users. The balance between encouraging trust between users while still keeping sensitive information away from the rest of the users can be hard to reach. Since these kind of platforms encourage the cooperation between users the users have to have some way of knowing they can trust who they are sharing resources with. Of

course, the level of information depends on the type of interaction the users will need to engage in, in some cases users might already know something about other users for example in platforms that provide a local service.

Another issue is the possibility of the platform being misused and how much control users have over the services that are provided. It should be considered what the end user will be able and unable to do through the platform and what the reasons behind the limitations are.

Finally, a platform for sharing resources is in many cases something that everyone should have access to, regardless of their capabilities. Especially in the cases such as Tvättstugetid where users are booking access to their laundry facility. People that do not own or use the technology needed to access Tvättstugetid still need to be able to get access to the facility. How can a digital platform be designed so that everyone will be comfortable with using it? A possible way is to have a non-digital extension of the platform for those specific users. However, that might bring up the issue of people feeling excluded from the service because they are using it differently from the majority. It is a difficult topic because using technology offers a lot of possibilities for the people that are willing to use it but it can also make things harder for the people that are not willing.

2

Background

This chapter presents the background of the thesis. It includes related theoretical work on digital calendars and the sharing economy as well as a detailed description of the context of the case study and similar platforms.

2.1 Digital Calendars

Calendars are generally used to organize and remember appointments and events. Digital calendars can provide easier access to the information since people no longer have to use a physical calendar. Additionally, they enable the possibility of multiple users accessing the same calendar and calendar views are therefore often used in booking systems to visualize availability. A few examples are low-fare calendars for booking flights, rental cars and hotel rooms, group class bookings in the gym and appointment bookings for haircuts, doctor visits and so on.

In their article, Neustaedter et al. [6] discuss and analyze the complexities of having shared family calendars. They discussed different approaches people have to visualize information in their calendars. For example, providing extra information for appointments on papers next to a physical calendar and using symbols instead of text for children that have not learned how to read yet. Furthermore, they discussed the problems people have with digital calendars and especially synchronizing calendars between users. One of the biggest issue people found was that there was different level of details needed between the calendars and they did not want their calendars to become cluttered with information they did not need. This makes it evident that designing calendars for multiple users is a very complex process with a lot of impacting factors.

2.2 The Sharing Economy

As presented by Lampinen et al. [1] the *sharing economy* or *collaborative consumption* are terms used for technological platforms that support sharing between their users. These platforms are creating more opportunities to use resources more efficiently. Furthermore, they are changing the definition of *sharing* because many platforms are used to earn money and that is not the traditional way of sharing. Lee et al. [2] explain collaborative consumption as being when individuals share, barter, or gift items or service. McLachlan et al. [7] suggest that items people own but are not using constantly are ideal for sharing. These could for example be hobby equipment or expensive tools, such as lawn mowers or snow blowers. This way more people could benefit from using them. Another possibility is to share time by helping others. Bellotti et al. [8] explain the concept of *timebanking* as being a system where people receive time credit for providing service to others. In turn, they can use their credits to receive aid from other users. A third possibility is when a service or item is provided by a third party (e.g. company or organization) who then gives a group of users access to it.

Malmborg et al. [9] identified issues to be addressed when designing for sharing in local communities. These issues are: *creating and sustaining community*, *exchange models*, *technology platforms*, *trust, give and take* and *societal and economic impacts*.

McLachlan et al. [7] investigated challenges in peer-to-peer resource sharing. They identified issues regarding items to be shared such as: *frequency of use*, *expensive item* and *liability for damages*. They touch upon the problem of items that are used infrequently and might therefore be convenient to share, are often seasonal or event based so a mismatch occurs between supply and demand. According to their results, expensive items that people mentioned most often they would want to borrow are often related to specialization in profession or hobbies. This makes it harder to find local people that actually own these items. Participants in their research were concerned about what the consequences would be if they would accidentally break the item they are borrowing as well as an item they were lending would break. Additionally, McLachlan et al. identified *trust* and *informal sharing* as challenges. Informal sharing regards the fact that participants stated that they would not use a specific platform for something they could just knock on their neighbors door for, such as a pot or a pan.

2.2.1 Motivation

According to Lee et al. [2], sharing provides environmental, economical and social benefits to the individuals that partake in it. One or a combination of these factors are what motivates people to engage in an exchange of this kind. Research has shown that views on the impact of monetary and non-monetary exchange differ. Ikkala and

Lampinen [10] came to the conclusion that the presence of money made both parties feel more at ease with the interaction since it was clear what was expected from each of them. Vohs et al. [11] on the other hand argued that money might make people less considerate because they felt that they had already brought what was expected of them to the table. Lampinen et al. [12] did a research on a timebanking system called *Kassi*. They discovered that the users often had negative feelings such as feeling of indebtedness after receiving help. However, they argued that rather than designing to avoid this feeling the design should emphasize the positive aspects of sharing.

2.2.2 Privacy and Trust

Trust touches on different aspects of the application. Users have to be able to trust each other so some kind of verification of users might be necessary before they are willing to collaborate with others. McLachlan et al. [7] indicated that people tend to trust people that they know or know of more than strangers so collaboration in a small community is more likely to work. There are different ways of increasing trust between strangers through the platform, for example having users rate each other and having the rating visible for other users but this depends on the type of platform and what is being shared. Furthermore, forcing identity verification or allowing users to communicate before borrowing or lending something can help them build trust.

Palen and Dourish [13] describe privacy as a dynamic process of protecting and sharing personal data that is under constant refinement. Meaning that when interacting with others we constantly react to fulfill what is expected by others and what we expect from ourselves. Furthermore, they state that managing privacy should not be done by following explicit rules but to continuously react to the ever-changing context. Privacy management is made especially difficult because it is both impacted by the individual himself and interaction between several individuals.

Privacy and trust are highly interconnected. In many platforms it is necessary to build trust by sharing personal data with others. These are likely to be platforms where sharing is between individuals since those kind of interaction tend to have higher stakes to them than when a service is provided by a third party [7]. Other platforms do not rely on any kind of interaction between its users but they are still likely to enforce some kind of privacy management to ensure that the users can keep personal information to themselves. Privacy can also relate to a group of users on a certain platform, how much information they need or want to share with each other, such as knowing who uses the resource and when. Platforms that require something like identity verification to create a basis for trust between users would most likely not share that information with the rest of the users. That is, the user is required to share specific personal information with the platform but that information is not public to the rest of the users.

2.3 Tvättstugetid

Tvättstugetid is a web application made by a company called Republic (*republic.se*). Republic is a small company based in Gothenburg. Most of their projects are for clients but Tvättstugetid is their own product. It is a system to organize the use of laundry rooms as well as other shared resources available in apartment buildings (such as sauna and guest houses). The application has been in use for several years and it currently has around 20 active accounts. The accounts are managed by the building administrators and each account provides various numbers of end users. The majority of accounts have between 10 and 50 end users.

To start using the product the owner or building administrator creates an account and takes care of the payment for the whole house based on its size. They can customize the calendars, for example by specifying how long the slots should be, how many slots a person is allowed to book and which days and times are available. They also control who has access to the calendar.

The end users are residents in apartment buildings. They are informed that they will be using this product and given access to it by their building administrator. Tvättstugetid can be accessed via a browser on any device so the end users can use the device that suits them best. Since the current users have expressed their preference in being able to enable notifications on their devices, native applications are in the works and will be published soon.

The interface of the end users will be the focus of this thesis. The users log in to their account to book time slots. The layout of the application differs according to screen size. Figures 2.1 and 2.2 show the initial screen layout on two separate devices. On desktop the user gets a comprehensive overview of the current week as well as information about their booking status. Available time slots are buttons with the text *Boka* and slots taken by other users are red. When the calendar shows days and slots that have already passed they become greyed out. This account has four separate calendar for the services they provides, these are displayed in tabs below the header. It is possible for the administration to publish messages to all users. If there are any messages, they appear below the calendar.

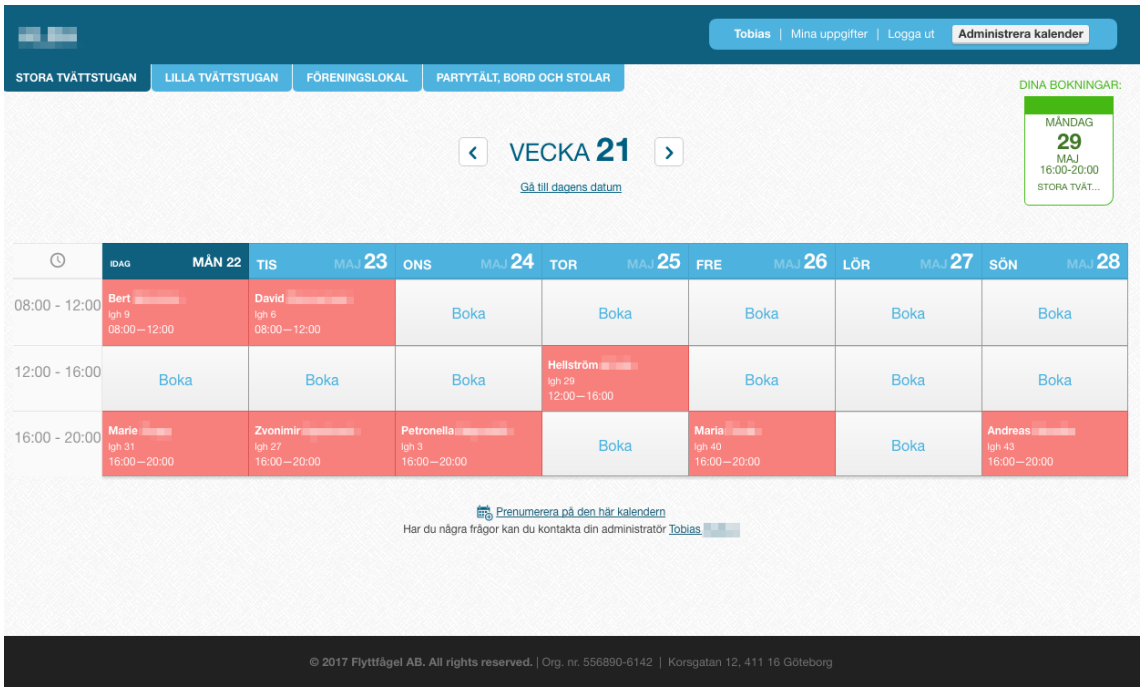

Figure 2.1: Screenshot from Tvättstugetid on a desktop computer. The interface an end user sees when opening the application.

Figure 2.2: Screenshot from Tvättstugetid on a mobile phone. The interface an end user sees when opening the application.

In Figure 2.1 a user named Tobias is logged in, the name is displayed in the top-right corner along with a *Logga ut* button and a *Mina uppgifter* button. The *Administratera kalender* button is only available for account administrators and allows them

to make changes to the calendar. The calendar shows that it is Monday in week 21, May 22nd, and each time slot is four hours long. The apartment building is displayed in the top left corner, an example account is called Testgatan as can be seen in Figure 2.3. The number of slots a user can make is decided by the administrator. In this example the user is allowed to book one slot. Figure 2.4 shows how the user's bookings are visualized.

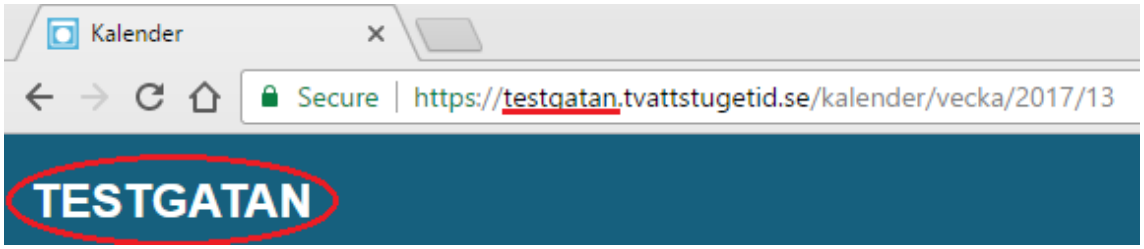

Figure 2.3: Screenshot from Tvättstugetid on a desktop computer. The apartment building is called Testgatan.

Figure 2.4: Screenshot from Tvättstugetid on a desktop computer. An example of a user that is allowed to have two bookings in place at any certain time and has booked one slot.

Figure 2.2 shows the layout on a mobile device for the same user example as was described above on a mobile device. The current day is on top and the user can scroll down to see the rest of the week. To move between weeks they have to use the arrows on either side of the week indicator.

2.4 Similar Platforms

There are many platforms available that are for collaborative consumption. These can for example be for sharing vehicles, accommodation, hobby equipments and tools. The rest of this chapter describes three examples of platforms; *Uber* [14], *Styr & Ställ* [15] and *Boka Tvättid* [16]. These examples were chosen to display platforms that have different purposes and emphasize different issues. Because of the similarities to Tvättstugetid, Boka Tvättid was considered to be ideal to analyze the two platforms in more detail. The differences between the three platforms lie for example in their hardware or software, in how they are accessed and what kind of sharing they support. Styr & Ställ has a stationary platform and users have to go to one of their locations to use it while the other two can be used anywhere on personal devices, as long as there is access to the Internet. The ownership of the objects provided in these platforms also varies. In Uber, the driver provides a service in form of rides between places and allows the passenger to benefit from their car without getting control over the car itself. Styr & Ställ and Boka Tvättid provide the user with the object and allow them to control it. While the user can take the object with them from Styr & Ställ the object of Boka Tvättid can only be used at a certain location.

2.4.1 Uber

Travis Kalanick and Garrett Camp came up with the idea of *Uber* in 2008 [17]. Uber is a mobile app that allows users to order a car to drive them between places. They are located in over 560 cities all over the world. Drivers can sign up and will use their own car. After each ride the passenger rates the driver by answering simple questions and vice versa. This is to ensure safety and quality. When a user signs up they provide information about themselves and choose a payment method. They are automatically charged after a trip so there is no need to carry cash or other forms of money for neither the driver nor the passenger. This way the driver is also guaranteed a payment after the ride.

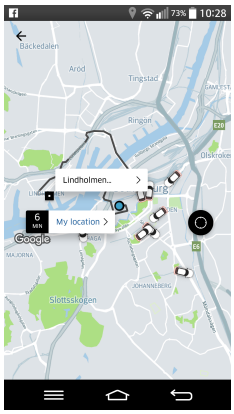

Figure 2.5: Screenshot from the Uber Android application. The user can see available cars close by.

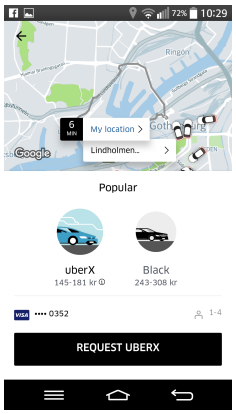

Figure 2.6: Screenshot from the Uber Android application. The user can choose a type of car.

When a user decides to order a car they open their app and specify a pick-up location. They can choose different types of cars, the possibilities depend on the city the user is in but the possible categories are: *economy* that are regular everyday cars, *premium* which are more luxurious big black cars, *accessibility* that provide a car seat for children and finally *carpooling* that you can share with more passengers going in the same direction. The user can decide between a selection of drivers close by and request that they will pick them up. The user interface is shown in Figure 2.6. When a driver has accepted the ride the passenger enters their destination. The driver does not know where they are going until after the passenger has been picked up. The passenger is shown the route and estimated time of arrival, they can send this information to their friends and family. When the trip is over the trip is automatically charged from the passengers chosen payment method. The price of the trip depends on the type of car and the distance the passenger wants to travel, a price range is given before the trip begins.

Uber is very concerned with safety on their trips, they want to ensure safety for both the drivers and passengers. This is apparent in many of their design choices, such as the rating system and that both parties can choose who they collaborate with. They also show the passenger the route which will be taken and enable them with the option of sending information about their trip to others so they know where they are and when they will arrive at a certain location.

2.4.2 Styr & Ställ

Styr & Ställ [15] is based in Gothenburg. They have set up renting stations spread over Gothenburg, each station has a terminal for the user to interact with and stands for bicycles (see Figure 2.7). For a user that will use the service regularly they offer

a subscription that is for the period from March to the end of December for 75 SEK. For short term users they also provide a three day pass for 25 SEK.

Figure 2.7: A passenger hiring a bicycle. [18]

On their website [18], Styr & Ställ explains how the platform works. Long term users will sign up on their website and a season card is sent to their address. Short term users can buy a ticket at any credit card terminal in one of their stations. When a user wants to rent a bicycle they log in with their card or ticket at a terminal and select an available bicycle. Each bicycle can be used for 30 minutes before the user is charged extra. If the user wants to continue without paying the extra fee they have to return the bicycle to one of the stations spread around the city, wait two minutes and then they can rent another bicycle. This is to make sure that people return the bike when they are done using it so there will be available bikes for other users. Each user is allowed to rent a bicycle 24 times each day.

One of the challenges with providing this kind of service is to make sure that the item is returned after use. Styr & Ställ has solved this by charging extra if the user uses a bicycle for more than 30 consecutive minutes. This way they can ensure that the users return it after active use but are still allowed to continue if they wait for a few minutes. Another issue is how to make sure that each station has both an acceptable number of available bicycles to rent but also available stands to return bicycles. They address this problem in different ways, one is to have short distances between stations so that users can go there instead. Another way they use to avoid this problem is to have someone move the bicycles by car to better manage the ratio between empty stands and stands in use.

2.4.3 Boka Tvättid

Boka Tvättid (Bokatvättid.se) has the same purpose as Tvättstugetid and is also based in Sweden. They provide the same service as Tvättstugetid but the design is different and special features vary between the applications. Building administrators can sign their houses up and the residents can log in to their account to book time to use the laundry room. They provide an application that is accessible through

a browser as well as apps for Android and iPhone. When a user wants to book a slot they log in to their account with their apartment number and a pin code. The default initial view when a user is logged in is a calendar overview of the month but they can change it to *alla lediga tider* which gives a list view of all available times. The different layouts can be seen in Figures 2.8 and 2.9.

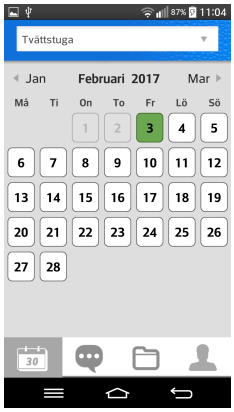

Figure 2.8: Screenshot form the Boka Tvättid Android Application. Calendar view.

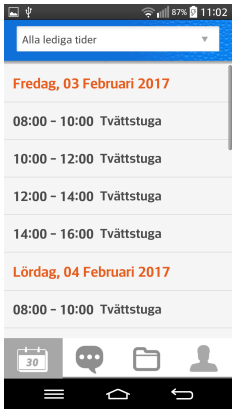

Figure 2.9: Screenshot form the Boka Tvättid Android Application. List view of available slots.

When a user has a slot booked for a certain day the calendar view changes the color of the day to green (see Figure 2.8). In a similar way, if no slots are available for booking the day will be red. The user gets a notification on their device to remind them of a booked slot. If someone else has booked a certain slot the user can see the apartment number. The application also allows apartment buildings to have shared documents to inform residents about events revolving around the building, such as cleaning days and announcements.

3

Theory

This chapter describes theoretical aspects that the project falls within. It is divided into three topics; software development, information visualization and user experience.

3.1 Software Development

In this section, relevant topics on software development for this project are presented. It includes definitions of cross-platform applications and the model-view-controller design pattern.

3.1.1 Cross-Platform Applications

Most web applications should be usable from devices of different kinds and sizes. This is not always the case though, and even though many of them are, there are often discrepancies between a big screen and a small screen. A Cross-Platform application should work equally well on all platforms. Seffah and Javahery [19] use the term Multiple User Interface (MUI) and define it as an interactive system that follows three principles: It provides multiple platforms for the same service, the platforms show the information in different ways, and finally it coordinates the services they provide to different users. The different views the platforms provide can emphasize different aspects but they should always maintain cross-platform consistency.

Wäljas et al. [20] formulated a framework for a cross-platform user experience. For the framework they identified three themes: *composition*, *continuity* and *consistency*. Composition is how the application is put together, what features are available in each platform and the functionality the application provides. Continuity regards the flow between actions and between platforms. Consistency stands for that the system is consistent between platforms, that navigation and appearance is similar. Of these three themes consistency is the biggest challenge because the abilities of

different platforms can be so diverse. Some compromises will most likely have to be made but the goal should always be to have the application consistent between platforms.

3.1.2 Model-View-Controller

Model-View-Controller (MVC) is a design pattern in software development. Trygve Reenskaug created the design pattern in 1978 [21]. His aim was to bridge the gap between the mental model of the user and the digital model in the computer.

MVC is a way of dividing the software into three separate parts, each taking care of one aspect of the software. The parts then communicate to transfer information between them. The model accesses the database, fetches, adds and updates the data. The controller takes care of the logic, changes the data and can send information to both the view and the model. The view is what the user sees, how the data is represented. A graphical interpretation of the connection between the parts is shown in Figure 3.1.

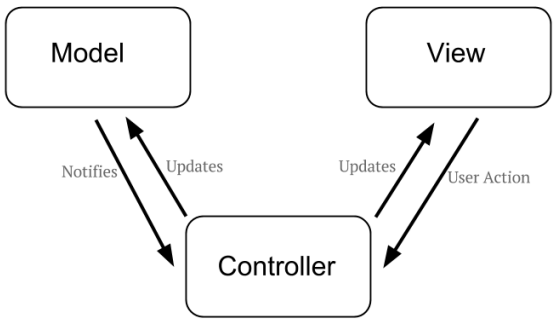

Figure 3.1: A graphical representation of the connection between the three parts of MVC.

3.2 Information Visualization

One of the biggest question for every design is how to visualize information for the user in a way that is not too obstructive but at the same time is easily perceived. Ware [22] stated that optimizing applications to demand less cognitive work from users should be the ultimate goal of interactive visualization design.

3.2.1 Gibson's Affordance Theory

In digital applications it can be hard to recognize if it is possible to interact with specific items in the application and how to interact with them. For example, should you drag something to move it or do you press the item and then click the location where you want it to end up. How do you know what works? In real life this is easily distinguishable, for example a button stands out visually and we see right away that it can be pressed. The perception theorist J. J. Gibson [23] used the term *affordances* for what people perceive as possible actions to interact with a certain item. He also argued that it was what people perceived only by looking at the item without using other sensory clues to help them understand how it works. His theory is not directly applicable to digital systems since users are never interacting with a real-life item but a digital representation of something. By pressing a button on the screen, the user is not using their hands to press the button but moving a cursor on the object and then pressing down one finger on a mouse. However, as Gaver [24] states, concepts from other disciplines are often borrowed to help highlight certain aspects of design. Gibson's affordance theory is commonly used to explain the perceived possibilities for actions components in a design have. The theory emphasizes how important it is to indicate to the user what can be interacted with and how they can do it in an obvious way. It should be noted that some methods of showing things digitally become traditional and therefore become something we learn and remember after we have encountered it a few times. People remember how common features look like and work, such as buttons and links. It is trickier to design new interactions that users are not familiar with.

3.2.2 Skeuomorphism and Flat Design

Skeuomorphism and flat design are design strategies in user interface design. A definition of *skeuomorphism* states that it is when a design tries to recollect something from the real world [25]. The goal with this is to make the digital world more familiar to the user, examples of this are to use images of letters for email and displaying digital books in a bookcase. While skeuomorphism can enhance understandability, especially for elderly users [26], this approach has met criticism because of its limitations. By always trying to imitate physical objects, the full potential of computers is not used and innovative design thinking is less likely to occur [27].

Pratas [28] states that the purpose with *flat design* is to create a simple and clean interface. This means that all extra elements and effects are removed from the design, such as shadows, lighting, depth and texture. Due to its simplicity, flat design can cause confusion in understanding which elements are static and which are interactive [29]. Figure 3.2 shows an example of how skeuomorphic and flat design might differ.

Figure 3.2: iOS 6 (left) is an example of skeumorphic design while iOS 7 (right) shows an example of flat design. [28]

3.2.3 Postures

Platforms can have different capabilities and restrictions which affect the possible designs. Cooper [30] used the word *postures* to describe how the design presents itself to the users. Applications that are aimed for mobile devices demand a different level of attention from the user than applications aimed for a desktop computer. Cooper used three categories for posture in desktop applications: *Sovereign posture*, *transient posture*, and *daemonic posture* and further described them. Sovereign posture is used to describe applications that the user uses for long and continuous periods of time with their main focus on said application, these can for example be word processors such as Word. Since they are used on big screens they do not have to conserve screen space but can display all basic options that are needed. The visual style in sovereign applications should not be too bold because users spend a lot of time looking at the interface. Visual feedback can be rich and there are many possibilities for the user to provide input to the system. Applications with transient posture are used for short periods of time and are aimed for a single function, examples are a calculator or a weather application. These kind of applications should be simple and easy to use. Since they are only used for short periods of time they can have elements stand out more visually than applications with sovereign posture, this can help the user complete their task more quickly. To further help the user complete their task swiftly the application should remember what choices the user has made before and what preference they have. Daemonic posture applications are run in the background and are rarely interacted with, such as network connections and drivers for printers.

Cooper [30] also reflects on posture in mobile devices. While tablets can be designed for in a similar way as desktop applications because of their size there is still the limiting factor of inputs from the user. Tablets do not provide the same various

possibilities as desktop computers. Since most tablet operating systems only support full screen applications they usually have sovereign posture but with a simpler interface than desktops. Mobile phones on the other hand are designed for mobile use and therefore bring a different kind of challenges to the design than desktop computers. Users want to be able to use applications while moving and perhaps in distracting situations, that is they might not want to have their full attention on the application. According to Cooper special attention should be put on that the display is clear and that the user can easily control the application. Furthermore, it is important to be able to know what is most important to display since the screen space is very limited.

3.3 User Experience

It is hard to define what exactly user experience (UX) is since it is affected by so many factors. Morville [31] presented a user experience honeycomb framework that includes seven factors or qualities a product should have. The factors are: useful, usable, desirable, findable, accessible, credible, and valuable. Furthermore, he emphasised the importance of both looking at these factors independently but also to consider how they affect each other.

User experience is a big factor in how successful a product can be and still it is extremely hard to design it. UX combines all factors of a software such as how fast it works, how understandable it is, how easy it is to use and so on. In a survey done by Law et al. [32] they investigated how various participants defined user experience, where the participants were researchers and practitioners from academia and industry. The results indicated that UX is often viewed as dynamic and highly dependent on the context. Furthermore, the way a user experiences a certain software is highly subjective to that use. The participants in the survey were asked about their definition of UX. The characteristics most used in their definitions were *comprehensive*, *easy to understand*, *simple*, *clear*, *concise* and *accurate*.

Banga and Weinhold [33] are strong advocates of keeping the interface of mobile applications as simple as possible. However, they mention that creating a successful mobile interface is made difficult by the fact that there is a very limited screen space to work with. Even though the application should be simple it still needs to be coherent to maintain usability. In this regard Cooper [30] used the term *inflecting the interface*. By this he means that to organize the interface with typical navigation of the user in mind. In other words, features that are most frequently used are most important to keep in convenient and immediately accessible locations while features that are less used can be placed deeper in the interface.

3.3.1 Measuring Quality in Design

After user experience started to be considered an important aspect of any design, many have started to speculate how to measure aspects of the design such as aesthetics, engagement and user experience itself. At a panel called *Can We Measure Quality in Design and Do We Need To?* Alistair Sutcliffe, John Karat, Suzanne Bødker and Bill Gaver discussed their perspectives on the matter [34]. Sutcliffe suggests that both qualitative and quantitative measures can be used to better understand how to improve design. In his opinion, theory can be used to understand human factors such as mood, arousal, emotion and action. Furthermore, it can explain how these factors can be influenced which in turn directs the process of the design. However, theory does not directly explain how anything should be designed but rather gives the designer knowledge on how to approach the problem. Karat feels the same way in that results from measuring quality with quantitative methods would at least produce knowledge on which designers can build on. Gaver and Bødker both mention the importance of considering the context in which the design is used when attempting to measure the quality of it. The context is a complicated system of many factors, such as the user group that the design is for, the mood of an individual user and perhaps cultural implications that depend on the location of where it is used. This makes it extremely hard to account for all things. Bødker still argues that it is possible to get meaningful results by combining focus on the context with an in-depth understanding of interaction details.

It is therefore possible to say that quality is influenced by many factors which makes it extremely hard to measure as a whole. It is easier to measure each factor separately, such as engagement or aesthetics but then it needs to be considered that each factor is only a part of the design. If only one factor is measured it would still not give a concrete idea of the design as a whole.

4

Methodology

The goal with the research was to identify challenges that might arise when designing a digital platform where multiple users can share resources. This was done through a case study which involved evaluating and improving a pre-existing product. It was important to define the process in the beginning of a project. The process serves as a guide for researchers and designers to help them achieve their goal and the collection of methods are the tools they use. Following is a brief explanation of different design processes that are used as inspiration for the process of this thesis and a description of methods that were relevant to this project.

4.1 Design Processes

This chapter describes two different approaches to the design process, Goal-Directed Design and Human-Centred Design.

4.1.1 Goal-Directed Design

One way of thinking when designing is to think of the users' goals. The concept of Goal-directed design (GDD) was created by Alan Cooper [30]. GDD emphasises the importance of understanding what the ultimate goal of the user is and the intermediate goals they have to get there. Cooper felt that there was a big gap between development and design, design was usually added after development instead of doing both simultaneously. GDD is meant to be a way to bridge this gap. Cooper states that when using a product the user has a specific goal in mind. The user wants to complete their goal as easily as possible and does not want to take a detour to get there. The essence of this design approach is to understand what the user wants to do and provide him with the easiest way possible to help him do it.

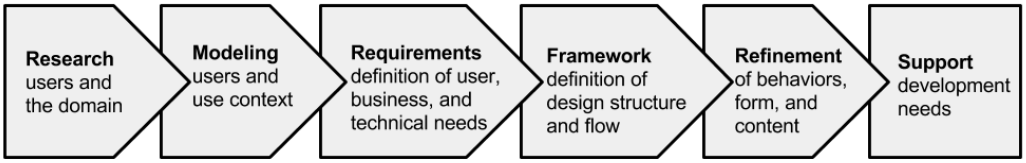

Figure 4.1: The Goal-Directed Design Process.

Cooper divided the design process into six phases as can be seen in Figure 4.1, the following text describes his definition of the process in more detail [30]. These phases guide the designer towards understanding the users and their motivations for performing certain tasks. In this process the design of the final product is integrated from the start while focusing on the significance of the goals of potential users. The research phase is used to learn about the users and context of the design and investigating similar designs. In the modeling phase the data from the previous phase is analysed to discover behaviour and workflow patterns. The requirement definition phase uses scenarios that are focused on the users being able to meet their goals rather than the tasks they need to perform in order to form a connection between the users and the framework of the design. A full concept is developed in the framework definition phase following by a refinement phase where the concept is evaluated by using walkthrough and validation scenarios to make sure everything works smoothly together. Finally the development support phase is when designers communicate with developers to address problems that arise during implementation.

4.1.2 Human-Centred Design

Human-Centred Design (HCD) focuses on the users of the prospective system. The ISO standard states: "Human-Centred Design is an approach to interactive systems development that aims to make systems usable and useful by focusing on the users, their needs and requirements, and by applying human factors/ergonomics, and usability knowledge and techniques." [35]

It is apparent that it is vital for any product that the end users of that product are happy with it but it is also important to remember other stakeholders since they can also have an effect on how successful the product will be. In his article, Krippendorff [36] talks about how HCD puts more focus on creating artifacts that attract wide user groups and are less concerned with making sure the artifacts work as intended by designers, producers and other stakeholders.

IDEO.org is an organization that focuses on HCD in their projects. They divide the process into three phases: inspiration phase, ideation phase and implementation phase [37]. The inspiration phase is used to get to know the context and stakeholders.

The ideation phase focuses on analysing what you have learned and coming up with solutions and make prototypes. In the implementation phase the product is implemented and finalised.

4.2 Data Collection Methods

It is important to have some way of getting to know the context of the desired product. This usually involves getting to know the users and understanding their needs and goals as well as understanding the context of which the product will be used in. Even though the perspective of the user is very important there are other aspects that should also be taken into consideration, this could for example be legal or ethical issues. This chapter gives a brief explanation of methods that can be used for collecting data and methods that can be used to work with that data. These methods can be used to collect either qualitative or quantitative data. According to Runeson and Höst [38] quantitative data is more about numbers and statistics, while qualitative data is about words and descriptions. Qualitative data is often harder to analyse because it is more in-depth and complex.

4.2.1 Literature Study

According to Martin and Hanington [39], literature studies enable the researcher to capture the essence of research and projects that have already been published and will benefit the current project. The researcher can find literature based on keywords that revolve around the themes of the current project. Reading and combining the results can give them insight and inspiration for their project as well as providing facts to work from during their own project. Snowballing is a term used when searching for relevant literature in a systematic way.

Wohlin [40] describes guidelines for snowballing which include finding a starting set of papers by using keywords. Then, references and citations in each paper are investigated as well as searching for papers by the authors. However, not all articles that turn up should be chosen for continuing the snowball and careful consideration needs to be taken before including a certain paper to make sure that it is in fact relevant.

4.2.2 Interviews

According to Sharp et al. [41] interviews help the researcher to get to know stakeholders. The advantage of interviews is that the interviewee has a chance to explain

in detail what they mean and provide the researcher with new information that they would otherwise not have learned.

Baxter et al. [42] point out the importance of having set clear objectives of the study and that all stakeholders agree on the purpose of the interview before coming up with and deciding which questions to ask. That way it will be easier to distinguish between questions that fit the objective and those who do not. They further distress the importance of planning the interview beforehand to ensure that the information needed from the interview will be gathered. An interview guide will help the researcher focus the interview in the desired direction. The guide can be on a scale from detailed description of what should be asked to a summary of topics that should be covered.

Interviews can be unstructured, structured and semi-structured and this is what the interview guide will reflect. Sharp et al. [41] give a description of the different types of interviews: Unstructured interviews are exploratory and have open-ended questions which allow the interviewee to express as much or as little as they want. Structured interviews have predefined questions and are more similar to questionnaires. Structured interviews are better suited when the researchers can identify what they want to know, as a result the questions tend to require an answer from already defined options. Semi-structured interviews are a mixture of the two. They allow the researcher to get answers to predefined questions but also give them the freedom to explore new subjects that might come up during the interview. The questions are both open-ended and closed.

Wadsworth [43] states that interviews should usually be recorded in some way to evaluate later. During the preparation phase it is important to decide how to document the interview. Different ways to do that is to video record, audio record and taking notes or any combination of those. Taking photos can also be useful to document something specific or to use as a reference when analysing the data. If the plan is to record the interview the researcher must get permission before it starts. They should also have an alternative way of documenting if the permission is not granted.

Focus groups are a type of interviews. In a focus group, a group of people is recruited to discuss a certain topic or subject. According to Martin and Hanington [39], participants should be carefully selected to represent different samples of the user group. A skilled moderator is necessary to make the participants feel relaxed and comfortable in sharing their opinions and experiences. They describe the benefits of a focus group as that they can give insight into recurrent topics and the logical thinking behind the opinions of the participants. In a focus group session other methods can be used to provide both quantitative and qualitative data about the context and behaviors of users. The session can be recorded to enable the researcher to review the data afterwards. They especially note that the result of the focus group does not necessarily represent how society as a whole would feel about the topic but they can provide qualitative data about the topic from different perspectives. This

is further enhanced by Baxter et al. [42] who suggest that focus groups can give insight into how your design is perceived, good or bad, but the results should not be generalized over all users.

4.2.3 Questionnaires

Sharp et al. [41] described the main attributes of questionnaires as being similar to interviews, questionnaires can both have open-ended questions and closed questions. They differ though in that they do not have to happen face-to-face. This means that it is important that the questions are clear and not ambiguous since there is no researcher to clarify the meaning to the person answering. Questionnaires can be used to get quantitative data while being less time consuming for the researchers than interviews. They further point out the importance of making sure that the questionnaire is readable and understandable before sending it out to multiple participants. Doing a test run on a colleague can be very helpful to make sure those requirements are met.

Wadsworth [43] emphasizes that a big drawback of questionnaires is that it will not explain *why* the participants feel a certain way and will not provide an opportunity to learn these things in the same way as for example interviews do. However, it is important to note that sometimes this is not necessary. Wadsworth gives an example that if the goal is to learn how many users have a certain problem with the product then a questionnaire is better suited. This means that questionnaires can often be used to get quantitative data while interviews are better suited for qualitative data.

4.2.4 Observation

As Martin and Hanington [39] stated, observations can be structured or unstructured. They describe unstructured observation as an ethnographic study where the researcher watches users in a certain context to gather new information. These kind of observations are best suited in the early stages of a process to get familiar with the context. Even though they are unstructured they should be documented in the same way as interviews. Alternatively they suggested that structured observations can be used when the researcher has a clear idea of what they would like to know. The researcher can ask the person being observed to perform certain tasks in order to see how they would go about it.

A field study is a type of observation. In a field study the researchers go to the users and watch them perform tasks in their natural context. Baxter et al. [42] described the usefulness of observations as to helping researchers identify external factors that might affect the use of a product, such as interruptions and distractions. They further state that a field study in users natural environment can capture things that would not be captured in a lab environment.

As for other methods preparation is important. That is, to have decided beforehand how much the researcher can interrupt the natural flow and how the observation will be documented.

4.2.5 A/B Testing

Martin and Hanington [39] define A/B testing as a method used to compare two versions of the same product. This provides statistical data that indicates which version is closer to the desired result. However, this method will not explain *why* one version is better than the other. For this method half of the users would get version A and the other half version B, which version the user gets is chosen randomly. Before the testing is begun the researcher must decide what they will test and how they will collect the data. This could for example be testing two different websites and measure the time each user spends on the website to indicate how engaging it is.

4.2.6 Think-Aloud Protocol

The think-aloud protocol asks participants to describe their thinking process while performing certain tasks. Martin and Hanington [39] state that it helps the researchers identify what confuses, delights or frustrates the users. This can both be done simultaneously with the tasks or after the user has performed the tasks. The tasks should focus on specific aspects of the design, not the whole concept. The protocol is usually used to supplement other methods such as interviews or focus groups.

4.3 Ideation Methods

This chapter gives examples of methods that can be used for data analysis and ideation after data has been collected and analysed.

4.3.1 Prototyping

According to Martin and Hanington [39], prototyping is an important step in the process. It helps visualize the concept and explore further different aspects of the potential design as well as helping team members to communicate their vision of the concept. They explain the concept as being a tangible representation of the design to help with testing ideas of either a whole concept or smaller parts of the concept.

Prototypes can be used to test certain features, either with other team members or with the clients and users.

Martin and Hanington [39] define two types of prototypes; high-fidelity and low-fidelity. They further explain the types and state that low-fidelity prototypes focus more on specific features and parts of the concept while high-fidelity prototypes represent what the finished product might look like. Common methods for making low-fidelity prototypes are *sketches*, *scenarios* and *paper prototypes*. These help the team synchronise their ideas and should not take much time in preparing. In some scenarios a low-fidelity prototype might suit better exactly due to the fact that it does not look like a finished product, which means that testers might feel like they could influence the final outcome. High-fidelity prototypes on the other hand are more detailed and give an idea of how the product might look and feel in the end. They require less imagination from the person that is testing it and therefore allows them to focus on the interaction and aesthetics. High-fidelity prototypes can for example be made with software which allows simple interactions or they can be implemented from scratch. They can be used for different purposes, for example for testing navigation or interaction between different elements.

Rudd et al. [44] describe the advantages of low-fidelity prototypes as being most useful in the early stages of the process when the requirements are being gathered as they help the development team and the customers to communicate visually. They are cheap to make and do not take a long time to prepare. On the other hand, they describe the disadvantages of low-fidelity prototypes and say that since they are usually crude they often miss important design decisions because many issues do not occur in the testing of the prototype.

Similarly Rudd et al. discuss the advantages and disadvantages of high-fidelity prototypes. They suggest the advantages being that they show how the design will look and work in the end. In these kind of prototypes all details thought through and can therefore be used for user testing. These kind of prototypes can be used for marketing and sales. The disadvantages are that the development is more expensive and time consuming.

Another approach to think about prototypes is discussed by Carolyn Snyder [45]. She describes why thinking about prototypes as being either low-fidelity or high-fidelity can be misleading and cause confusion because people can have different ideas of what is high-fidelity and what is low-fidelity. Instead she proposes the idea of considering four dimensions of prototypes: *breadth*, *depth*, *look* and *interaction*. These dimensions can then be somewhere on the scale of low to high fidelity. This way of thinking would give a better description of what the prototype is like and how it should work.

4.3.2 KJ Method

The KJ method is used to organize ideas, results and thoughts of the design team. Marting and Hanington [39] described the process. Each team member gets sticky notes and a pen, then they write down anything they can think of related to the design and put them up on a wall where everyone can see. After a pre-determined amount of time the participants stop writing and instead start trying to group the sticky notes together and form themes around them, each group of notes gets a descriptive title. This is all done in silence which means that everyone gets to express what they are thinking without succumbing to group pressure. It also allows all group members to have a say in a very time-effective manner since it is done simultaneously by everyone.

4.3.3 Personas and Scenarios

Personas are descriptions of possible users. Alan Cooper [46] introduced personas in a book called *The Inmates are Running the Asylum* in 1998. He described the usefulness of personas as being a tool to help developers and designers to visualize how the product would be interacted with. Martin and Hanington [39] indicate that personas do not have to be realistic and sometimes extreme personas can help identify edge cases but personas should be current or possible users of the product. Personas are helpful in seeing a design from another perspective. Different users will use the design in different ways and for a product to attract a wide user group it is important to consider various aspects during the design process.

Scenarios are written descriptions of how a certain persona would use the design. Martin and Hanington [39] argue that scenarios help the researcher go through the process step-by-step from different perspectives. Scenarios should be made for both regular use of the design but also for extreme but realistic circumstances to explore different cases of how it will be used.

5

Planning

The time plan for the thesis is shown in Figure 5.1 and the actual time plan is shown in Figure 5.2. The time plans are represented with a Gantt chart and they have the same color coding. Yellow represents Easter. Orange is for planning and preparation tasks, purple is for the execution tasks, green is for writing tasks and blue is the presentation. The first four weeks and the last four weeks are marked with a whole line, dividing the weeks into the preparation stage, the execution stage, and finally the writing and presentation stage. Originally the execution stage was divided into three iterations marked with a dotted line but shortly after the project had begun it was decided to not have iterations since it became clear that some of the phases described in the next section would not be applicable for certain iterations. Instead each phase is reflected upon before beginning the next phase to make sure that it desired results have been produced.

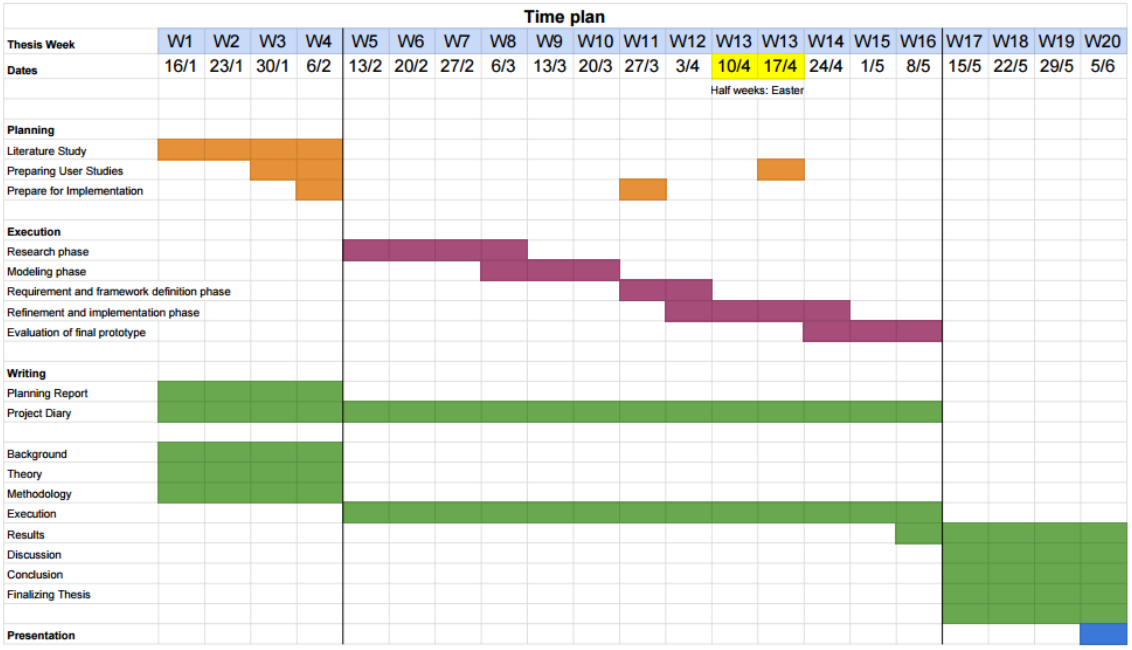

Figure 5.1: A Gantt chart showing the time plan of the project.

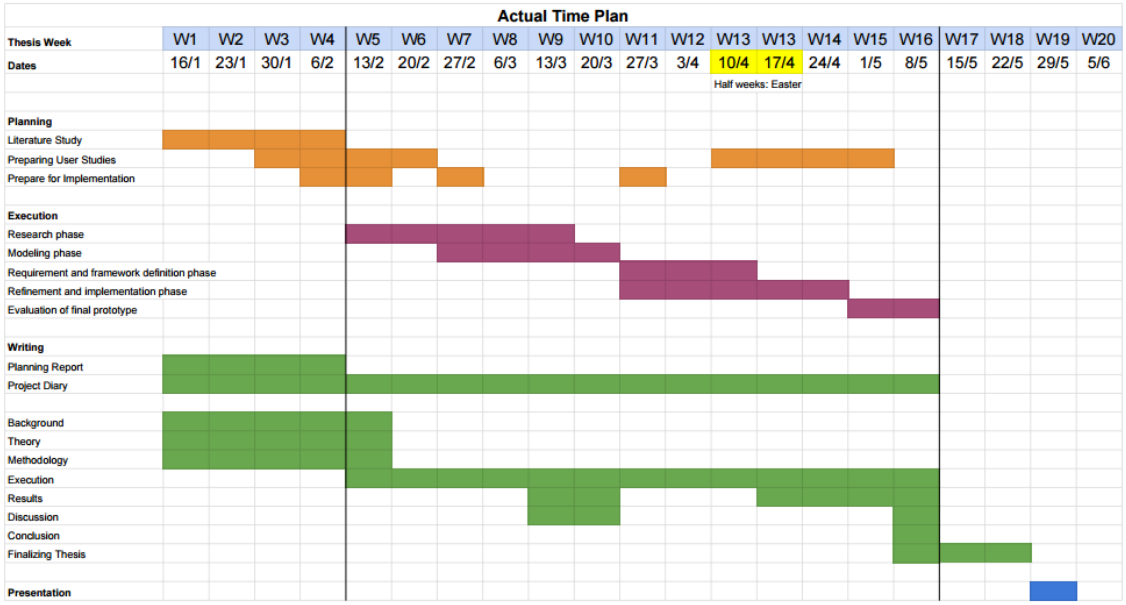

Figure 5.2: A Gantt chart showing the actual schedule of the project.

5.1 Design Approach

The thesis used Tvättstugetid as a case study to research the subject of a sharing platform. Since there was already a version of the product complete and being used by actual users it provides a good starting point for the research. The subject of the thesis was to examine how the users use the product, therefore it was important to investigate the interaction the users have with Tvättstugetid and how they feel about the product. It is clear that both Goal-Directed Design and Human-Centred Design put the interest of the end user at the forefront in their process, although they approach it from different perspectives. For this thesis the Goal-Directed Design (GDD) process was used. This was because the project has already been defined by a current version of Tvättstugetid and the phases of GDD were believed to make the process more structured than the Human-Centred design (HCD) process would do. However, other stakeholders were also very important in this project. Especially since the end users are not the ones to decide that the product will be used but are instructed by someone else to use it. Therefore, the building administrators' perspective as well as the perspective of other stakeholders was kept in mind throughout the process. This is a part of the HCD process that was integrated into the planned process.

Initial literature and background study was done during the first four weeks, the next twelve weeks that are identified as the execution stage, is where the phases of GDD were followed. The first five phases of the GDD process were used; research, modeling, requirements, frameworks, and refinement. The requirement and framework definition phases were combined into one phase. Since there was only

one student doing both design and implementation the formality of the development support phase was not used, but problems and new insights were addressed when they arose. The refinement phase was integrated with the actual implementation of the design. The final phase was an evaluation of the prototype.

Two possible ways of exploring the possibilities for the prototype were considered. The first one was to prepare two different prototypes and then use the A/B testing method to compare and evaluate them with a user study. The second way was to design and implement one prototype that would be improved through the process. The latter method was chosen due to the fact that the project was very limited by time and manpower.

5.2 Method Choices

This section describes the reasoning behind the chosen methods for each of the phases.

5.2.1 Research Phase

The research phase should be used to gather data about the users. By using more than one method to gather data the subject can be approached from different angles, this strategy is called *triangulation* [41]. In the user study, triangulation could be used by both interviewing end users and using the think-aloud method. The think-aloud protocol was chosen to identify problem areas with the current design as well as features that could be improved with regards to user experience. Another option would have been to do an observation but since the objective was to talk to real users that have already used the product, not exploring the context the think-aloud protocol was more suitable. It could provide an idea of what the user was thinking rather than only showing what they were doing. The interviews were semi-structured to get information about aspects that were thought to be relevant but also allowing room for discussing aspects and experiences that the participant mentioned and might provide valuable insights. They were audio recorded, provided the interviewee agreed. During the interviews the interviewee was asked to perform simple tasks in the application while thinking aloud to explain their thinking process. Interviews were considered to be more beneficial than focus groups in this thesis. An important factor is that many of the participants would have Swedish as a first language and even though they might speak English they might tend to feel less comfortable in doing so in front of a group of people. Also, although some interviews might be in Swedish the researcher is not experienced enough to be able to follow and moderate a discussion with multiple people simultaneously in Swedish.

5.2.2 Modeling Phase

During the modeling phase the data should be analyzed. Due to time constraints, the interviews were not transcribed entirely but parts of them that were considered to provide meaningful results were transcribed. The workflow of typical users was identified and personas that represented different users were created. Different types of goals were identified by analyzing data from the interviews and a KJ was done to summarize the results and start initial discussion on possible solutions.

5.2.3 Requirement and Framework Definition Phase

In the requirement and framework definition phase, scenarios along with other low-fidelity prototyping methods were used to elicit user requirements. The scenarios were created around the personas created in the modeling phase. Sketches aided in getting a clearer picture of what the process is for the user when using the application and what should be emphasized in the final design. They helped connect actions that the user should be able to perform to achieve their goal.

The low fidelity prototypes were evaluated, tested and discussed with the employers of Republic who created the product. They are experts in the product and in their field and provided valuable insight for the design of the prototype. It was believed to be a time effective way of figuring out what was important and what was most likely going to work well in the final prototype.

5.2.4 Refinement and Implementation Phase

Finally the refinement and implementation phase was where features of the high-fidelity prototype were implemented and validated. The prototype was made with HTML, CSS and JavaScript and was evaluated in the subsequent phase.

5.2.5 Evaluation of Final Prototype

The final prototype was evaluated in a similar way as Tvättstugetid in the user study. The user testing sessions were designed to give qualitative data about suggested improvements and the general feeling participants had of the prototype. The participants were asked to solve specific tasks using the prototype and then a discussion about the prototype followed. This phase was aimed to validate the identified challenges and how they were addressed.

6

Execution

In this chapter the process of the project work is described. The chapter is divided into six sections; Preparation phase, Research phase, Modeling phase, Requirement and Framework Definition phase, Refinement and Implementation phase, and the Final Evaluation phase. Each section describes the process of that phase.

6.1 Preparation Phase

The preparation phase was used to get to know the domain of the thesis, both theoretical and practical aspects. A detailed plan for the process was made and the first iteration was prepared.

6.1.1 Literature Study

The aim of the literature study was to gather information of different aspects of the project. The results from the literature study provided a clearer image of the scope of the project. The literature was found by looking through material from courses the student had previously taken and searching for articles by using relevant keywords. These keywords were for example on the topics of cross-platform design, collaborative consumption platforms, trust in online platforms, methodology, calendar applications and more. The main source of papers and other references came from using the search provided at the Chalmers library website and the ACM digital library. If an article or book was considered relevant the references it pointed to were also examined to see if they were applicable as well.

6.1.2 Preparing for Implementation

To prepare for the high-fidelity prototyping that would provide a part of the end result, tutorials were completed on HTML, JavaScript and CSS. This was to refresh

the memory of the student of the syntax and the basic concept of web development. The current code of Tvättstugetid was also examined to get an idea of how it was built.

6.2 Research Phase

During the research phase the user study was planned and data about current user accounts in Tvättstugetid was gathered.

6.2.1 Interview Planning

Interviews were planned with possible users of Tvättstugetid. The purpose of the interviews was to explore people's laundry practices, how Tvättstugetid fit with their needs and how easily certain features were discovered.

The interviews were semi-structured and a think-aloud protocol was integrated in the interview to see how users interact with the current version of Tvättstugetid. The participants were ten in total, one has been using Tvättstugetid for eight years while the remaining nine are using another booking system for their laundry facilities. An interview guide (Appendix A) was prepared with questions and tasks for the users to solve by using Tvättstugetid. The interviews started with a short introduction of the project and a description of the purpose of the interview. The questions were divided into two sections, one section included general questions about the participants' routine when doing laundry and the other section contained questions that were specifically about Tvättstugetid. The process was as follows:

- Introduction.
- General questions.
- Performing tasks by using the desktop version of Tvättstugetid.
- Performing tasks by using the mobile version of Tvättstugetid.
- Specific questions and a discussion about Tvättstugetid.

One question was added for the participant that was a current user of Tvättstugetid, it was the question *"How long have you been using Tvättstugetid?"*.

It was decided to ask the participants to test the desktop version before the mobile version because the desktop version is more complete and has more features than the mobile. That way the participants would get to know all the features of the application from the start and would be able to say what was missing from the mobile version. If they notice the absence of a feature it might indicate that they believed the feature was useful.

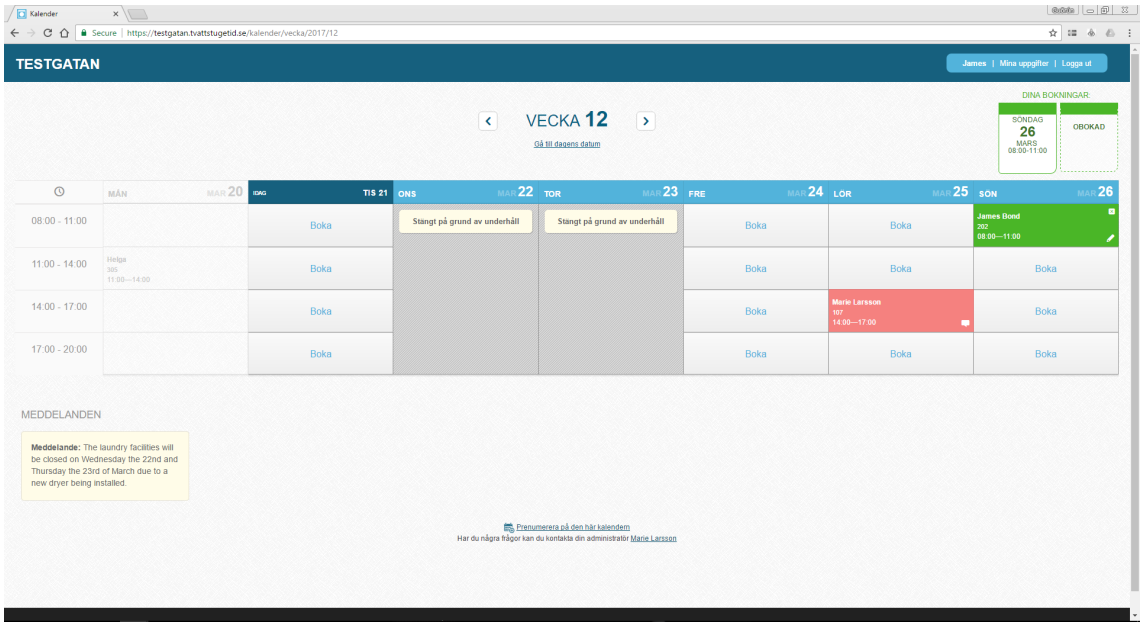

Figure 6.1: Screenshot from Tvättstugetid on desktop. An example of the setup for the user test sessions.

The tasks were designed to see how easily the users could understand the application and discover certain features. Figure 6.1 shows an example of how the system was setup for the participants. Adjustments to the setup were made for each participant based on what day it was when the interview was taken. Furthermore, in the figure the name of the user is *James* (displayed in the upper right corner) but in the interviews this was changed to the name of the participant. The aspects of what the tasks should investigate are listed below.

A. Actions
   - A1. Book.
   - A2. Unbook.
   - A3. Move between weeks.
   - A4. Move between days on mobile.

B. Features
   - B1. Discover *Dina Bokningar* shortcut.
     - B1.1 To know the limit for how many bookings were allowed.
     - B1.2 For checking the user's booked slots.
   - B2. Discover possibility to read and write comments in calendar.
   - B3. Discover messages from the administrator displayed below the calendar.

A pilot interview was carried out to make sure that no severe problems would arise during the upcoming interviews. The pilot study took place in the office at Republic, the participant had been using the application for 8 years. There were two interviewers, the assistant asked the questions and took notes while the student took more detailed notes. The interview was audio recorded and the tasks on desktop

were video recorded as well. An application that was used recorded both the user and the screen so it can be determined where the user is looking as well as emphasizing where the user clicks with the mouse. The tasks on mobile phone were not video recorded but instead more detailed notes were taken during that part of the interview. The interview was in Swedish and both testing devices were provided by the interviewees. In the pilot study the questions about Tvättstugetid were asked before the testing session but it was decided to move that part to the end because it would be easier to discuss directly after using the application. Since no severe issues arose during the pilot study, the interview was included in the results.

The participants were recruited with snowball sampling through connections, by talking to friends and family to see if they or someone they knew were willing to participate. The goal was to get a diverse group of participants with different daily routines and living with a various number of people. The only requirement was that they had access to a shared laundry room facility and use it regularly. The participant in the pilot interview was a current user but the other nine participants had not used the application before. Three of the interviews were taken through a video conversation where the participants shared their screen with the interviewer, these were recorded in the same ways as the other interviews. Four interviews were in Icelandic and the remaining five were in Swedish. Participants were offered *fika* during the interview and three were offered lunch after the interview took place. Each interview session lasted between 30 to 60 minutes and participants were provided with a computer and smartphone to use during the testing, except for the ones that were interviewed through a video conversation, they used their personal devices.

General information about the participants and the interviews can be seen in Table 6.1. It shows the age of participants, their gender, their nationality, the language spoken during the interview and how many people they live with.

Participants					
Interview	**Age**	**Gender**	**Nationality**	**Interview language**	**People in apartment**
Pilot	55	Female	Swedish	Swedish	2 adults 1 teenager
1	18	Male	Icelandic/Swedish	Icelandic	3 adults (roommates)
2	26	Female	Icelandic	Icelandic	2 adults 2 children
3	39	Female	Swedish	Swedish	1 adult 1 child
4	24	Female	Swedish	Swedish	1 adult
5	48	Female	Swedish	Swedish	1 adults 1 teenager
6	27	Female	Icelandic	Icelandic	2 adults 1 child
7	22	Female	Icelandic/Swedish	Icelandic	1 adult
8	32	Male	Swedish	Swedish	2 adults 1 child
9	64	Female	Swedish	Swedish	1 adult

Table 6.1: Attributes of the participants.

6.2.2 Account Data from Tvättstugetid

Currently there are approximately 20 accounts active in Tvättstugetid. Each account is maintained by a company or building administration that manages their users and the rules for their facilities. These accounts were inspected to see possible ways of setting up the system and if there was anything that was alike between accounts. Tables 6.2, 6.3 and 6.4 show the minimum, maximum and average value of three attributes; booking limit, number of slots per day and length of slots. The data was only collected from calendars for laundry facilities but it became evident that some administrators also create calendars for other services their building provides, such as parking lots, guest houses and saunas. A few accounts display information below the calendar, for example a reminder to the users to clean after they have used the facility and if the person that has a booked slot has not started washing within a certain time frame someone else can use the facility.

Booking limits		
Minimum	**Maximum**	**Average**
1	4	2

Table 6.2: Data on booking limits gathered from viewing all active accounts in Tvättstugetid.

The booking limit indicates how many bookings the user is allowed to have at each given time. Roughly 85% of the accounts have the limit of 1 or 2 bookings and no account has a limit higher than 4 bookings. The accounts where the limit is higher than 2 tend to have shorter slots meaning that there are more slots per day.

Number of slots (per day)		
Minimum	**Maximum**	**Average**
3	14	5

Table 6.3: Data on number of slots gathered from viewing all active accounts in Tvättstugetid.

Length of slots (hours)		
Minimum	**Maximum**	**Average**
1	5	3

Table 6.4: Data on length of slots gathered from viewing all active accounts in Tvättstugetid.

Approximately 80% of the accounts have main calendars where each day is divided into 3 to 5 slots and the length of these slots are generally between 3 and 5 hours. It is also quite common to have a different length on either the first or the last slots of the day. Additionally, the calendars that are for other services (e.g. parking slots and guest houses) often have one slot per day.

6.3 Modeling Phase

In the modeling phase data from the interviews was reviewed, the KJ method was used to identify themes and possibilities for different options. Furthermore, personas were created and users goals were identified based on the results from the interviews.

6.3.1 Interview Analysis

The purpose of the interviews was twofold, to understand the laundry situations of the participants and to evaluate Tvättstugetid. The first questions asked in the interviews were general and aimed to understand how participants do their laundry and what is provided in their laundry facilities. A summary of the laundry facilities and the booking systems used can be seen in Table 6.5.

Laundry facilities				
Household	**Facilities**	**Current booking system**	**Access**	**Allowed bookings**
Pilot	2 washing machines 1 dryer 1 drying cabinet	Booking table with locks	In basement where the laundry facility is	1 at a time
1	4 washing machines 1 dryer 2 drying cabinets	Paper calendar	In basement where the laundry facility is	1 at a time
2	2 washing machines 1 dryer 2 drying cabinets	Web based system	From any browser	4 slots a month
3	4 washing machines 1 dryer 2 rooms with clothes lines	Computer system	In basement where the laundry facility is	Did not know
4	2 washing machines 1 dryer	Booking table with locks	In basement where the laundry facility is	1 at a time
5	2 washing machines 1 dryer 1 drying cabinet	Web based system	From any browser and in basement where the laundry facility is	1 at a time
6	2 washing machines 1 dryer	Paper calendar	In basement where the laundry facility is	No limit
7	2 washing machines 1 dryer 1 drying cabinet	Booking table with locks	In basement where the laundry facility is	1 at a time
8	2 washing machines 1 dryer	Computer system	In basement where the laundry facility is	Did not know
9	3 washing machines 1 dryer 1 drying cabinet	Booking table with locks	In basement where the laundry facility is	1 at a time

Table 6.5: General information about the laundry facilities.

What is provided in the laundry facilities varies but all facilities have at least one washing machine and one dryer. Out of the ten households, seven have access to two washing machines, one has access to three washing machines and two households have access to four washing machines. When a household has a booked slot they have access to all the machines simultaneously. All the households have access to a dryer and drying cabinets are also common, being accessible in six of the ten facilities. Furthermore, *household 3* is provided with a room to hang up clothes where they can be left for longer periods of time.

From the interviews it became evident that it is very common for the households to be only allowed to book one slot at a time and one household is limited to 4

bookings per month. *Households 3* and *8* were not aware if there was any limit to their bookings and *household 6* does not have any limit. It can be assumed that where limits are in place they are designed to enforce some kind of fairness, so that one or several households do not book all slots leaving a few without a possibility to do their laundry. Another factor is that the owner might want to control the resource consumption of the building. This means that a balance needs to be found to keep both parties happy. Some participants described ways that either they used or they knew were being used in their buildings to get around the limits. One household explained that doing their laundry at night meant they did not have any time limits to uphold and meant they did not need to use the booking system. Several participants said they preferred getting the last slot of the day because then they could continue doing laundry even though their slot had expired.

Preferences		
Household	**How often laundry is done**	**How far ahead slots are booked**
Pilot	Once a week	When needed
1	Once every 2 or 3 weeks	When needed
2	Once a week	When needed
3	Every other day	When needed
4	Once a week	1 week
5	Twice a week	When needed
6	Once a week	3 months (as far as is possible)
7	Once every 2 or 3 weeks	When needed
8	Every day or every other day	When needed
9	Once a week	1 week

Table 6.6: Participants' laundry preferences.

Table 6.6 shows the laundry preferences of the participants. Half of the participants do their laundry once a week, one participant does it twice a week and two do it less frequently. The two participants that do their laundry every day or every other day have their own washing machine in the apartment meaning that they do less laundry at a time. *Household Pilot* owns a washing machine but preferred using the shared facilities most of the time and therefore does laundry about once a week. Seven households book slots when they realize they need to do their laundry and

the majority of them finds it easy to get a free time soon but two of the households said it could take up to five days to get a slot that suited them. *Households 4* and *9* said they used the opportunity when they were doing their laundry to book the next appointment since their booking system is only accessible in the facility, meaning that they booked with one week in advance.

What the participants liked about having a web based system is not having to go anywhere to book a time, they can just do it in their apartments or wherever they are. However some participants were using a web based system that they really did not like and one even preferred going to the basement to book a slot rather than to try to use the system on their own computer.

Owning vs. Sharing		
	Pros	**Cons**
Owning	- Do not have to leave the apartment. - You know what is being washed. - Can do it whenever you like. - Can sort the laundry more - Privacy. - Don't have to plan in advance.	- If something breaks you have to take care of it.
Sharing	- More efficient washing. - No laundry in apartment. - You only wash when you really need to. - Better equipment.	- Can only choose from available slots. - Difference between standards others have can create conflicts. - Have to spend a chunk of your day being at home and doing laundry.

Table 6.7: Comparing owning a washing machine to having a shared laundry facility.

Table 6.7 shows statements participants made when asked to compare having their own washing machine and using a shared facility. Most households try to do laundry about once or twice a week when they use a shared facility. The most common perceived benefits are that it does not involve having laundry all around the apartment. Instead the facility can be used to do both the washing and drying. In general people think having a shared facility forces them to do all their laundry in one go and then it is done instead of doing a little bit every day but it varied if they considered this to be an advantage or a flaw. Shared facilities usually offer more than one machine as well as providing a dryer and/or a drying cabinet so they can do more laundry at the same time meaning that the task is more efficient than it would be otherwise.

Most facilities have written rules or some kind of information on paper hanging on a wall, one household said the same paper had been hanging on the wall since 1982. However, not many participants remember what the rules say explicitly but assume it is something like *remember to clean after you use the facility* and *pets are not allowed*. If something breaks in the facility all households said they would contact a janitor or the housing administration via phone or email.

All participants were positive towards Tvättstugetid after the testing session, it was either stated that they would prefer using that than what they are currently using or that it was really similar to what they had now. It should be noted that six of the ten households are currently using a booking system that is solely accessible in their laundry facility. Meaning a web application does provide the obvious benefit of being accessible anywhere, especially considering that all participants are comfortable with using technology of this kind. Three participants said they would most likely use their computer if they were to use Tvättstugetid and the rest stated that they would use their smartphones. However it was mentioned that some people might not be comfortable with a web based system. Even though none of the participants were in that category themselves they stated that they knew of other people in their building that were.

To track booked times most participants mentioned they would prefer a notification sent to their phone, one suggested an SMS since they do not own a smartphone. A few also mentioned that they would like their bookings to be synchronised with Google Calendar or another calendar application.

6.3.1.1 Testing Session

Tvättstugetid is a relatively simple system with a transient posture. This means that users use it for short periods of time and for a specific task. This was confirmed during the interviews when several participants mentioned aspects that emphasised this. "*If I would have an app [for booking the laundry facility] on my phone I would not need to log in every time so it would just be a matter of opening the app and booking*" (Household 2) and "*It should be really easy and smooth [to find and book a time]*" (Household 6).

In the research phase section a list of *A. Actions* and *B. Features* to explore in the user testing sessions was presented. The following text will discuss how the participants solved the tasks. The participants were asked to perform the tasks on desktop first and then on mobile. The tasks were exactly the same for both devices.

A. Actions

The participants were asked to solve tasks to see how they perceived the application should be interacted with.

A1. Booking

All participants were able to book slots without problems on both types of devices. Figure 6.2 shows how one day could possibly look like, the available slots are big buttons with the text *Boka* written in them. On a desktop the color of the button changes to light green when the user hovers over it, indicating clearly that it can be pressed. One participant was not sure if they needed to do anything more after pressing the slot they wanted to book, "*Do I need to save my booking somehow?*" (Household 8). However, this might be something that new users learn quickly, since

that participant realized when they booked another slot that they did in fact not need to do anything more. On a desktop an animation shows the booking being transferred to the *Dina Bokningar* shortcut (see Figure 2.4), which is to help indicate that the booking is complete.

Figure 6.2: Screenshot from Tvättstugetid on desktop. A day with four possible slots and one booking by another user.

A2. Unbooking

Most users also thought that unbooking a slot was simple, "*Booking and unbooking is very easy*" (Household 1). Similar comments were made in other interviews. However, two participants did not realize immediately how to unbook and first tried the edit button (a booked cell can be seen in Figure 6.3). This might also be considered to be something the users learn quickly and will not think about again, especially since the majority of the participants had no problems with these two actions. The fact that the participants that tried another action first realized quickly how the system worked further enhances that the action is easy to understand even though it might not be the first thing that comes to mind for all users.

Figure 6.3: Screenshot from Tvättstugetid on desktop. How a slot that is booked by the current user looks like.

A3. Moving between weeks

The participants were asked to solve tasks that should make them want to move between weeks in the calendar. Figure 6.4 shows how this looks in the application. This action was not a problem for any of the participants although a few participants

took a little longer to think before realizing what to do than when they were booking and unbooking.

Figure 6.4: Screenshot from Tvättstugetid on desktop. The displayed week and how to move between weeks.

A4. Moving between days on mobile

This action is the only one that is not the same on desktop and mobile. On desktop all the days of the current week are displayed simultaneously while on mobile the user has to scroll down to see all the days of the current week. The participants tried various ways to do this. One participant started to scroll down but then rotated the phone and due to the fact that it was a big phone the view now displayed was the same as on desktop. All the other participants used the application in portrait mode. Five participants moved between weeks when trying to go to the next day on the mobile and one tried swiping. They did all eventually figure out that they should scroll to move between days but a few comments such as "*It's a lot of scrolling*" (Household 6) and "*I would like to have the same overview as [on desktop]*" (Household 9) were made by various participants.

B. Features

The participants were asked to solve tasks that might lead them to discover certain features present in the application. Table 6.8 shows a summary of the division between how many participants discovered and did not discover the features.

Discovering Features		
Number of participants	**Yes**	**No**
B1.1 Used Dina Bokningar shortcut to know the limit for how many bookings were allowed	7	3
B1.2 Used *Dina Bokningar* shortcut to check booked slots	5	5
B2. Discovered the possiblity to read and write comments in the calendar	3	7
B3. Discovered that messages from the administration were displayed below the calendar	1	9

Table 6.8: How many participants discovered certain features available in Tvättstugetid.

B1. Discover *Dina Bokningar* shortcut

The booking shortcut is only visible in the desktop version of the application, it can be seen in Figure 6.5. When asked how many bookings they were allowed to make (*B1.1 To know the limit for how many bookings were allowed*) most participants guessed from the *Dina Bokningar* shortcut on the desktop but four participants confirmed this by booking as many as they could until they got a dialog indicating they had reached their limit. Three participants however answered they did not know. Since the desktop was tested first the participants often remembered how many bookings they were allowed to make when they were asked to use the mobile device, but also commented that they were not able to see the shortcuts to confirm their guess. One user (*household 4*) tried to zoom out to get a better overview when they started using the mobile version. A few participants mentioned that they would like to see the booking information on mobile as well.

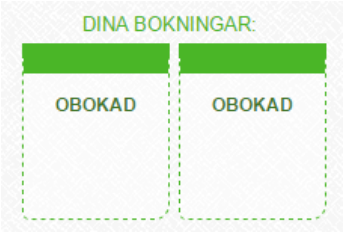

Figure 6.5: Screenshot from Tvättstugetid on desktop. The booking shortcuts located above the calendar.

Another task for the participants was to *B1.2 For checking the user's booked slots*. This could be done either by looking in the calendar itself and in the *Dina Bokningar* shortcut above the calendar. Five participants looked for the answer in the shortcut above the calendar. Various factors might influence where the users look for their booked slots, "*It's easy to find in the calendar since there are not that many bookings*" (Household Pilot). This suggest that if the shared laundry facility is not used very much the calendar would not be overflowing with information which might make it easier for the user to find what they were looking for in the calender.

B2. Discover possibility to read and write comments in calendar
The participants were asked if they could book a specific slot that was already booked by someone else. That user had made a comment about only using the dryer so if anyone wanted to use the washing machine they were free to do so. This can be seen in Figure 6.2. Seven participants did not discover the small bubble indicating a comment had been made on that slot and answered that they could not wash their laundry at that time. Three participants realized that there was a comment and said that they could not book but they could wash their laundry. Furthermore, two participants mentioned that they would then like to be able to answer the comment to make sure that nobody else would use the machine.

B3. Discover messages from the administration below the calendar

Figure 6.6: Screenshot from Tvättstugetid on desktop. A message from the administrator is displayed below the calendar.

Figure 6.6 shows a message from the administrator. The message is displayed below

the calendar. It should be noted that it depends on the screen size if the message is visible without scrolling. Participants that were provided with a device to test on could see the title *Meddelanden* but not the message itself on a desktop. The fact that only one participant noticed the message might be influenced by the fact that they were not asked directly if there was a message but rather if they knew why the laundry facility was closed for two days. This means that they did not realize that there was anything more to know than what said in the calendar. However, the participant in the pilot has been using the application for 8 years and was not aware that this was a possibility in the application which suggests that maybe the message should be placed in a different location or the users might need to be notified when a new message is posted to make sure that they see it.

Miscellaneous
The results from the interviews confirmed that the biggest problem area of the application is the mobile version, this was supported by comments from the participants that said they would like to have a better overview on mobile that should be similar to the one on desktop.

Two participants suggested that it would be nice to be able to send messages to other users. One participant said this was because the laundry room is locked and only the person that has booked the current slot can get in so their common Facebook page was often used to ask for someone to open the laundry room for them because something had been forgotten in the room.

One participant said they would like to see a footprint of the water usage of the building to monitor how much water was being used. Another suggestion was to be able to sign up on a waiting list for a certain slot, this was from a participant that lives in a building where the calendar tends to be fully booked days in advance.

6.3.2 KJ

A KJ was done with the owners of Tvättstugetid meaning that there were five participants. The purpose was to summarize the results from the user study and explore possible solutions to issues that had been identified. Before the session, statements and observations from the interviews were written down on post-it notes and put on a wall so that they were clearly visible. In the beginning of the KJ session a summary of the results were presented to the participants. They were then asked to write down any suggestions for improvements or other comments they had about the application on post-its. These were put on a wall with the ones written before (see Figure 6.7).

Figure 6.7: The wall with all post-it notes before grouping related notes together.

Then the participants grouped the post-it notes that they thought were related together. When all post-it notes had been grouped, names for the groups were found which helped identifying themes. Figure 6.8 shows the result.

Figure 6.8: The wall with all post-it notes after related notes had been grouped together.

The themes are listed in Table 6.9. After the session, a discussion took place about the themes and what aspects the prototype should focus on. It was considered how certain themes affected the design and what should be taken into account for the prototype. The themes impact the possible design solutions in various ways and how important it is to take them into account differs. In the end a decision was made to focus on the mobile version which would among other things include exploring possible ways of providing a better overview for the users. For this many of the themes are relevant such as *mobile overview*, *scrolling problems* and *dina bokningar on mobile* but other themes should also be kept in mind, for example *limits* and *communication*.

Preferred devices	Laundry facility setup	User facts	Similar booking systems
Notifications	Visual design	Communication	Slot suggestions
Dina Bokningar on Mobile	Desktop overview	Confirm action	User preferences
Booking history	User booking plans	Basic functionality	Unbooking
Mobile overview	Limits	Washing preferences	Overlapping bookings
Management of laundry facility	Scrolling problems		

Table 6.9: Themes that were identified with the KJ method.

6.3.3 Personas

Two personas were created based on the description in chapter 4.3.3. The personas were made to represent different types of users and were assigned attributes from the interviewees to give a realistic image of possible users of the application.

Jamie Smith
Jamie is 43 years old and lives in an apartment with his wife and their two children. Jamie and his wife both have a daytime job from 9-17 and weekends off. Their older child is in school and the younger in kindergarten. They are only allowed to book the laundry facilities four times each month so they try to keep it to once a week. This gets hard though since the children regularly get sick so they need to use a slot within a week from the last one. The apartment building has a web-based system to book slots and to get into the laundry room they have to scan a chip, this can only be done by the people that booked the current slot. This means that if someone

forgets something in the laundry room they have to contact the person that has the next slot to open for them, usually people do this in the common Facebook group. The laundry room does usually not have many bookings so they tend to book slots just when they need it.

Sara Bergstrand
Sara is 28 years old. She is a nurse at the Emergency Room in the hospital. That means that she has a very dynamic schedule. She gets a new schedule every 6 weeks which tells her what days she is working and what shift; the day shift, evening shift or the night shift. She lives with her boyfriend and their one year old girl. Sara prefers doing laundry on Monday evenings because then her boyfriend is also home so one of them can look after the baby. To book the laundry facilities she has to go down to the basement where the laundry room is and write her name in the slot she wants. Three months are available at a time and she books appointments for all that time because the slots go fast with so many families living in the building. There is no limit on how often they can book but they try to get one session a week. Both Sara and her boyfriend work out at least 3 times a week, when both of them are busy the child's grandmother babysits.

6.3.4 Goals

Several goals were identified during the analysis of the data gathered during the interviews. These goals are what users could be able to achieve by using the application and can both be end goals and intermediate goals that help the user get closer to their end goal. Some of the goals derive from something the participants explicitly said they wanted but others were identified by analyzing the system and what it should offer. The goals were divided into three categories; important, wanted, and extra. Important goals are what is vital for the users to be able to do. Wanted goals are something that would make the user experience better but are not necessary. Finally, extra goals are something that enable the users to do something but are not necessary for the application, these could for example be something some users want to do infrequently.

Important Goals

- Log in: Users should be able to log in to their account.
- Log out: Users should be able to log out after they have used the application.
- Available slots: Users should see what slots are available for booking.
- Navigate between time periods: Users should be able to see a certain time period and navigate to see more.
- Book: Users should be able to book a slot. In some cases they might want to book a slot a few days in advance and in other cases they might want to book an approximate slot.
- Unbook: Users should be able to unbook a slot they have already booked.

- See booked slots: Users should be able to see the booked slots they have coming up.

Wanted Goals

- See bookings from other users: Users might want to keep track of who uses the facility and when.
- Communicate with other users: Users might want to contact each other, for example if a previous user of the laundry facility has forgotten something.
- Messages from administration: The administrator might want to message the users, e.g. notify them if something is broken.

Extra Goals

- Divide a slot: When there is a possibility to share the provided service the users might want to do so.
- See footprint of water usage: Users might want to see an average of the water consumption from usage of the washing machines.
- See history: Users might want to be able to explore the history of their bookings.
- Sign up for a waiting list for a certain slot.

6.4 Requirement and Framework Definition Phase

In this phase possible designs were generated as low-fidelity prototypes. The first step was to create sketches with pen and paper. These sketches were discussed with the owners of Tvättstugetid. In cooperation with them some of the ideas were further developed and made digital to test the basic functions and how they fit on different screen sizes. Finally, one solution was chosen and scenarios around it were written to examine it in more detail and refine on.

6.4.1 Sketches

The first sketch was generated by reflecting on statements made by participants in the user study on the subject of sharing slots. In the KJ session it was decided that the prototype should focus on the mobile layout of Tvättstugetid and that is what the rest of the sketches explored. In sketches 2, 3 and 4 different ways of visualizing the calendar were explored while sketch 5 shows an alternative solution without a calendar view. The sketches were made to investigate design possibilities and help identify the benefits and flaws that could arise. The sketches were then discussed and evaluated with the owners of Tvättstugetid and pros and cons of identified. Then,

digital versions of some of the sketches were made to see how they might actually look on different screen sizes and if certain interactions might prove problematic on smaller screens. The screen size of an iPhone 5 was chosen to test the size of the designs due to its small screen, the designs were also tested on bigger screens but it was important to make sure everything could work on the smallest screens. This also helped see if the users would be able to actually press what they wanted to press, and not accidentally press something else.

Sketch 1: Dividing slots
From talking to the only participant that was a long term user of Tvättstugetid it was inferred that not many users use or even know of the possibility to comment on their slot in the calendar. This was further supported by the fact that only three participants discovered this feature. Additionally, it was considered an issue that it was not possible to answer the comments. Since this feature was added to allow users to communicate, for example to say that they did not need all the machines, an alternative solution was explored. Figure 6.9 shows how it might look like if users were able to share the service with someone else. In this case the user could decide if they wanted to use only the washing machine, only the dryer or both. The default choice would be that they would book both but could deselect one or the other if they wanted to. This could then be enhanced to having multiple machines that users could choose from. However, with this solution it would become an issue how to display and interact with multiple choices on each slot. For certain types of services it would be possible to solve this by having multiple calendars for each machine or parts of the service. Another possible issue is that the users might not even want to share their slot with someone else. They might want privacy and not having to interact with others while doing their laundry. Furthermore, having to go and deselect machines is extra work that they might not see as necessary since they might not feel they would get any direct benefit from it. From the user studies it became evident that the system should be simple and easy to use and this idea would make it more complicated. Therefore, it was decided not to consider the idea of dividing slots between users any further.

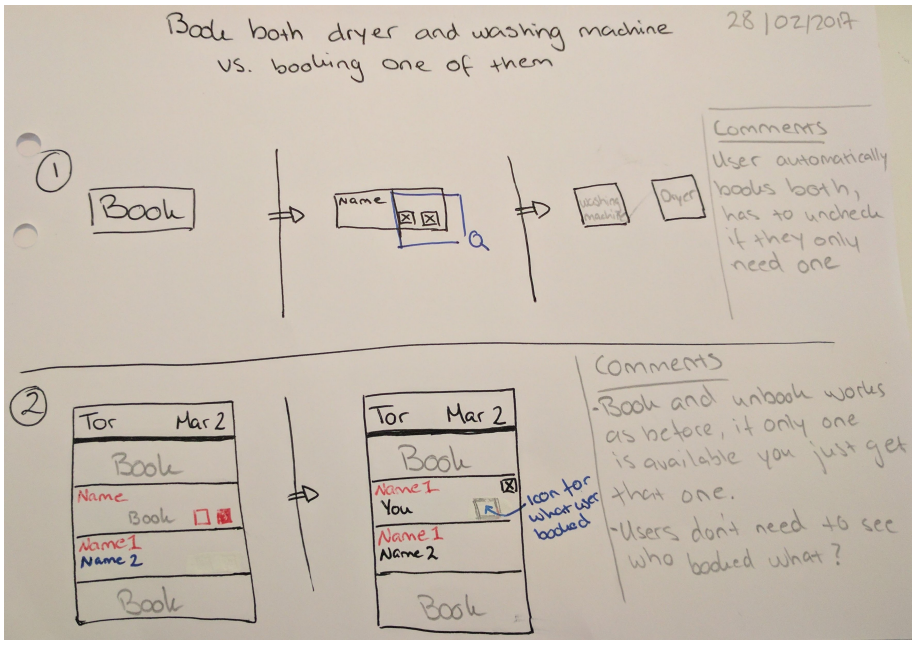

Figure 6.9: A sketch of how the interaction might work if users could share a slot by booking only part of the service.

Sketch 2: Option A for monthly overview on mobile

One of the most common statements made in the user studies was that the participants wanted to get a better overview on the mobile device and they often mentioned that they liked how it was on the desktop. Since the exact desktop layout does not work on mobile because of the screen size, a different solution is necessary. Figure 6.10 shows one of the ideas generated. Part A of the figure shows a layout of the month where previous days are greyed out, making the current day stand out. Then bookings that have been made are visualized with dots, grey dots are bookings made by other users and green are bookings made by the current user. The dots are aligned so that they indicate which slot is booked. This was considered a possibility since 80% of the current users of Tvättstugetid have between 3 and 5 slots each day. This could potentially give the user a good overview with details of what slots are available. In turn, a limit might need to be set as to how many slots the days can be divided into so that it does not become too cluttered.

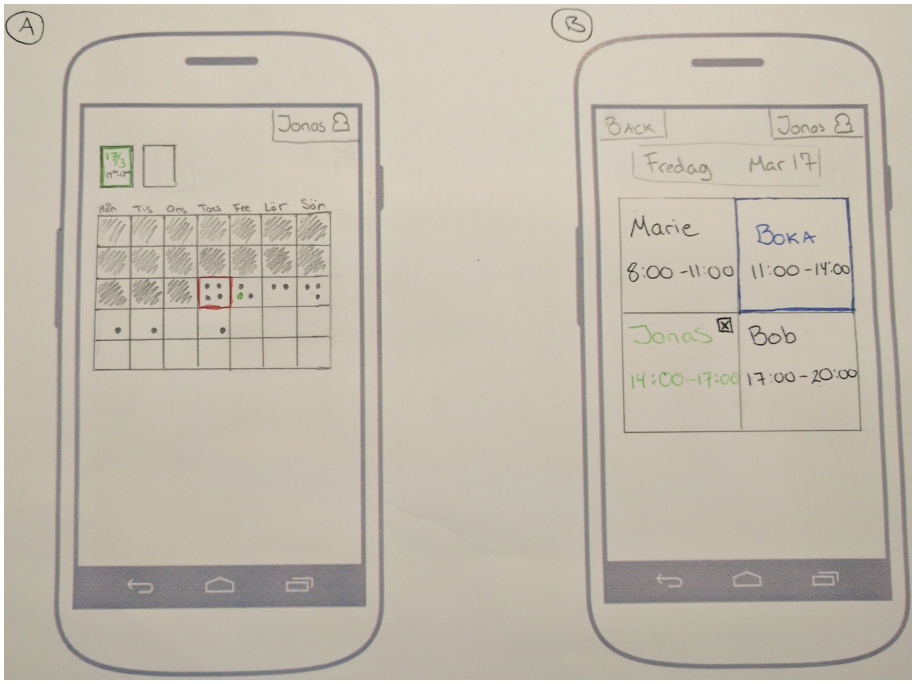

Figure 6.10: A sketch of a possible monthly overview on mobile, showing the current month and a possibility to move between months. Booked slots are represented with dots.

Digital versions of the sketch were made and are displayed in Figures 6.11 and 6.12. With digital sketches it became easier to see how different number of slots might be visualized. A change was made from the paper sketch so that empty slots were presented as empty circles to clearly show how many slots were in each day. Filled circles represent taken slots and a border around a circle means that this slot is booked by the current user. When the user clicks on a day in the calendar a list of the slots for that day appears below the calendar, allowing the user to book or unbook slots. It was agreed on that the bookings should take place on the same screen as the overview rather than move the user to a new screen because the two actions are interconnected.

Figure 6.11: A digital sketch of how a monthly overview might look when each day has three slots.

Figure 6.12: A digital sketch of how a monthly overview might look when each day has four slots.

In Table 6.10 pros and cons of this solution are displayed. They were identified during the discussion session with Republic.

Sketch 2	
Pros	**Cons**
- Provides an overview of the coming weeks.	- Might be difficult to find user's own bookings in the calendar.
- Clearly indicates available and taken slots.	- Majority of users are limited to 1 or 2 bookings so they might not need to see full four weeks all the time.
- Users are not likely to need to move between months often relative to a weekly view.	- Takes 2 clicks to book a slot.
- Shows how many slots are on each day.	- Takes 2 clicks to unbook a slot.
- Shows the user their upcoming bookings.	- Only works when there are few number of slots on each day.
	- Gets easily cluttered.
	- Not clear how to unbook
	- Towards the end of the month users might need to move to next month.

Table 6.10: Pros and cons of the concept displayed in sketch 2.

Sketch 3: Option B for monthly overview on mobile

Figure 6.13 shows a suggestion on how to avoid the issue of aligning the dots up depending on how many they are. In this case a loading icon is displayed which becomes filled up depending on the bookings made on that specific day. This solution would allow any number of slots. Two possible options on how to fill up the loading icon were considered. The first one would be to start on top and then move clockwise until it is completely filled up. The second option would be to assign a position to each slot on the icon which would be filled up respectively to the slots that are booked. With more slots it would become more difficult to comprehend the exact timing of the ones that are booked.

Figure 6.13: A sketch of a possible monthly overview on mobile, showing the current month and a possibility to move between months. Slots are represented with a loading icon on the days.

Digital versions of the sketch are shown in Figures 6.14 and 6.15. Alternatives for the loading icon were discussed and the first figure shows a circle that is empty when no slots have been booked on that day and then gradually fills up with a darker color according to how many slots have been booked. The second figure shows how each day might look if the slots were represented with lines that show if the respective slot is booked or not. The loading icon from the paper prototype was believed to show too much information while not being clear enough. These two alternatives show one solution that might work for users who do not need to know exactly which slots are booked and another solution that shows these details more clearly. Additionally, the second solution might make it easy for users to see a connection between the lines displayed and the list that is displayed when they want to book slots.

Figure 6.14: A sketch of a possible monthly overview on mobile where availability on each day is represented with different opacity inside a circle.

Figure 6.15: A sketch of a possible monthly overview on mobile where lines represent slots on each day.

During the discussion session with Republic pros and cons of this option were identified. Table 6.11 shows the results. Items that only concern one of the two alternatives are especially marked.

Sketch 3	
Pros	**Cons**
- Provides an overview of the coming weeks.	- Might be difficult to find the user's own bookings in the calendar.
- Users are not likely to need to move between months often.	- Majority of users are limited to 1 or 2 bookings so they might not need to see full four weeks all the time.
- Shows the user their upcoming booking.	- Takes 2 clicks to book a slot.
- Works for any number of slots per day.	- Takes 2 clicks to unbook a slot.
- **(Lines)** Shows exactly if the slots are booked or not.	- Unclear how to unbook.
	- Towards the end of the month users might need to move to next month.
	- **(Circle)** Initial difficulties to understand what the different gradients stand for.
	- **(Lines)** Becomes more difficult to understand the details when there are more slots.

Table 6.11: Pros and cons of the concept displayed in sketch 3.

Sketch 4: Weekly overview on mobile
An alternative to showing a monthly view is to provide a weekly view of the current week, similar to the desktop but minimize the information displayed in the calendar. Figure 6.16 shows a layout where the user sees the current week and the possible slots. Slots that are booked by other users are not possible to book, this is indicated by not showing the *Boka* text on the button. Furthermore, information about who has booked the slot is not displayed as it is in the desktop version. This information could potentially be showed when the user presses a booked slot.

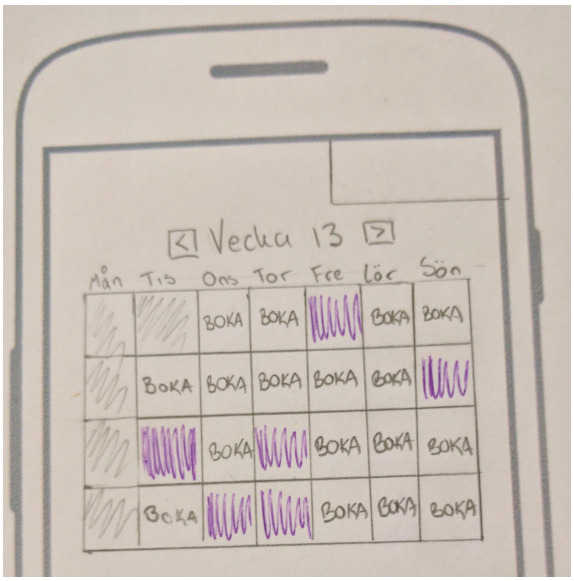

Figure 6.16: A sketch of a possible weekly overview on mobile, showing the current week and a possibility to move between weeks.

One of the biggest problem with only showing one week at a time is that often many days that have elapsed are still displayed, even though they do not show any useful information. This means that the user might often need to move between weeks. Figures 6.17 and 6.18 show the digital sketches for this solution. They show how it would look like depending on which day of the week it is. They were especially tested on iPhone 5 to see if it was possible to press the exact slot easily enough because there was no further action possible to change the slot other than unbooking and trying to book again. This was deemed good enough.

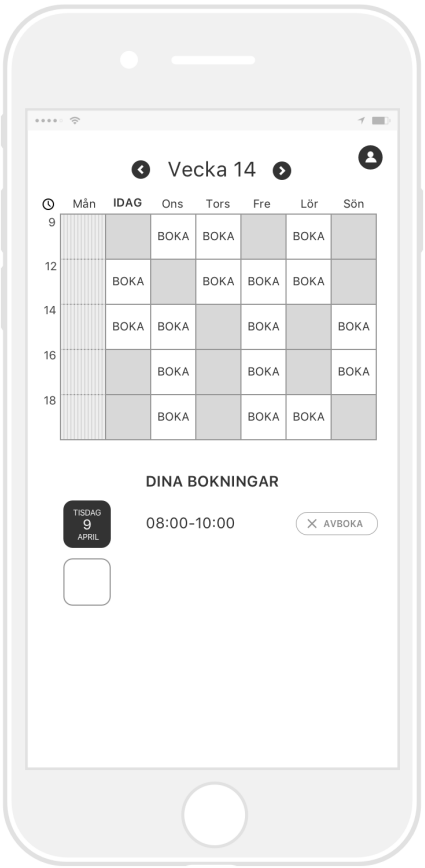

Figure 6.17: A digital sketch of a possible weekly overview on mobile.

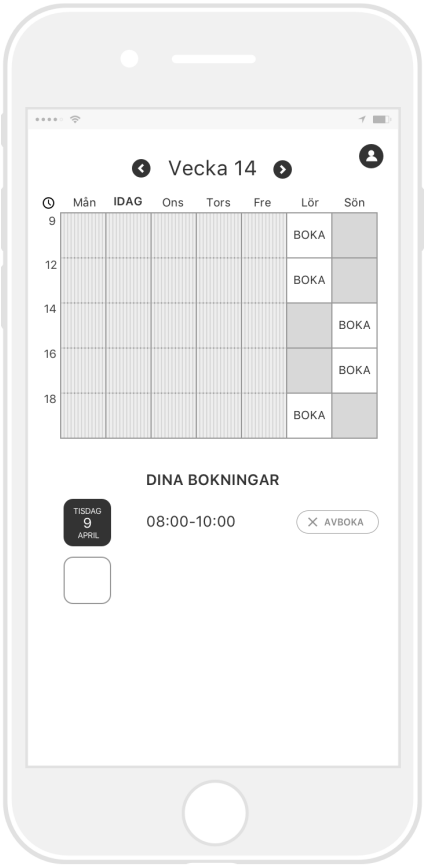

Figure 6.18: A sketch of a possible weekly overview on mobile when the week is ending.

In Table 6.12 pros and cons of the design identified during the discussion with Republic are stated.

Sketch 4	
Pros	**Cons**
- Easy to comprehend which day it is.	- Towards the end of the week users might need to move to next week.
- A weekly view suits people that want to find a slot soon.	- If there are many slots on each day the calendar might become crowded.
- 1 click to book.	- Less suited for users that want to book further than a week in advance.
- 1 click to unbook.	
- Overview of possible bookings.	
- Clear how to unbook.	

Table 6.12: Pros and cons of the concept displayed in sketch 4.

Sketch 5: Show next available slots in a list
Seven out of the ten participants said that they usually like to book slot when they realize that they need to do their laundry so they tend to try to get the next available slot that suits them. From this perspective an idea about showing the next available slots in a list was generated (see Figure 6.19). This would provide the users a good overview of the upcoming available slots making it easy to compare the times to find the one that suits best.

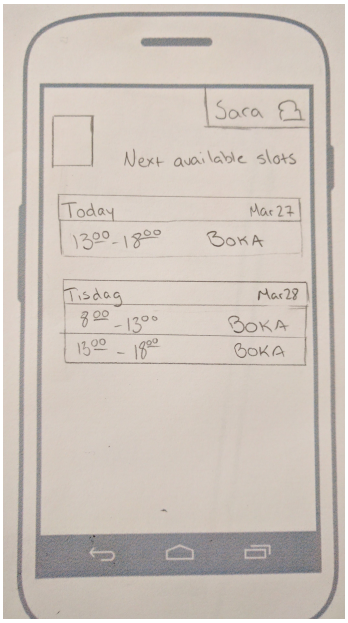

Figure 6.19: A sketch of how a certain number of next available slots could be shown in a list.

This solution was thought to make a good alternative for user settings but since it would not work on its own, it was decided to not work further with it for this thesis.

6.4.2 Evaluation of Sketches

During the discussion session with Republic a few general topics were examined. These topics concerned one or more sketches simultaneously. Firstly, it was the subject of displaying each month or week separately or displaying time continuously, for example by always showing a certain number of weeks. The latter option would bring the benefit of less action needed to see further ahead but it would also mean that for the weekly view solution it would demand more screen space and the monthly view solutions might become less comprehensible. Finally, the decision was made to keep the months/weeks separated. That is a common way of thinking about time and since the product is only used for short periods of time each instance so it was believed that the users would be more efficient if they are used to understanding time in this way.

Secondly, it was wondered if the length of the slots should be visualized differently, e.g. showing longer slots bigger in some way. We concluded that it would make sense to give the visual hint to the users so they can easily perceive if they are booking a short slot or a long slot. Especially, since the data from the current account shows that the first or last slot of the day is often of a different length than the others. However, this means that if one slot is much longer than another the proportions can easily become confusing. This scenario needs to be addressed in some way.

Finally the way of moving between months or weeks was discussed. The first option would be to do it similar to the way it is now, by having arrows on each side of the week header that the users click. Swiping to left and right is another option. The third option would be to scroll down. Since the design is for mobile devices we decided that scrolling down would feel most natural in this context. Because when people are looking further ahead they still might want to see information regarding the current day or week, this would not be possible if the users would go to a new screen every time they want to see the next time period.

The different ideas emphasize different aspects and some might work better in different contexts than others. When we were choosing the idea to work further with we used Tables 6.10, 6.11 and 6.12 for reference. They helped us compare the strengths and weaknesses of the different ideas and find the idea that would work best for Tvättstugetid. We reached a mutual conclusion to make a prototype from the idea shown in *Sketch 4*, meaning that a weekly view would be provided. This was supported by the results from the user studies that most users do not book far ahead so seeing four or five weeks ahead all the time might be unnecessary to them. The monthly views also add one step to booking and unbooking which in the context of Tvättstugetid does not seem to yield enough benefits to be feasible. By having to click different days to see the details the user does not get a full overview at once and might need to move back and forth to compare days. We also discussed providing the user with a choice between a weekly and a monthly view but will leave that for future work.

The chosen idea was further developed during the session to figure out certain details and resolve problems we could see right away. The goals that were identified in the modeling phase (Section 6.3.4) were used as a reference when deciding what features should be in the prototype. All *important goals* were included and one *wanted goal* was partially included; that users should see bookings from other users. Since users need to see what upcoming slots are booked it was decided that users should see upcoming bookings from other users but not passed ones. Figure 6.20 shows an updated sketch with the changes we made. There we have made a dropdown list to allow the user to move between calendars. Currently the different calendars are displayed in tabs at the top of the page but we decided that a dropdown list would make better use of screen space. We also moved the *dina bokningar* unit above the calendar and reasoned that it would be easier for users to book if they were using their mobile device with one hand since they could reach it more easily.

Figure 6.20: The solution that was chosen to prototype.

We also decided to show four weeks at a time, displaying each week below the previous one. If users want to see the next four weeks or the previous four weeks they would be provided with buttons to do that below the final week. This would

be better for the user, for example in the case where the current week is coming to an end and they need to go to the next week. When users want to compare information that is on separate pages they need to remember information from one screen to the next, so we proposed that showing more than one week on each screen would allow them to compare different weeks more easily. When deciding on the number of weeks to display a few aspects were considered. Two weeks were the minimum since the end of the week would allow the user to see too few days and users might often want to have easy access a few weeks ahead to see how busy the calendar is. Endless scrolling could make the navigation more confusing and easier for the users to get lost in the calendar so we decided to limit it to four weeks. Since the extra weeks are not all displayed at once they do not take up important screen space but are still available for the users to see if they want to.

6.4.3 Scenarios

The following scenarios were written to analyze the flow of the design and flesh out the details that we might have missed.

Scenario 1
Persona: Jamie Smith
Family: Wife and 2 children

Jamie's apartment building has started using a new system for booking the laundry facilities. It is called Tvättstugetid and due to how the system is built some changes to the rules for the facilities have been changed. Each apartment was provided with one account to the system and each apartment is allowed to make one booking at a time. Today is Saturday and the family is having a bit of a cleaning day. This means that they have a lot of laundry such as bedsheets and cloths as well as clothes from the past week. Jamie picks up his smartphone and opens an Internet browser. He goes to the url of his apartment building and logs into his account with his wife's email and password. Preferably he would like to find a slot sometime today or tomorrow so that they can have their laundry done before the next week starts. Unfortunately, weekends are preferred by most of the other apartments as well so the next two days are fully booked, except for Sunday at 16:00 which does not suit them since they are going to a birthday party. Jamie scrolls down to see the next week and sees that the last slot on Monday, from 18:00-22:00 is available. This is the only slot that works for them since they are both working during the day. Jamie presses the *Boka* button to book the slot. Now his upcoming booking details are displayed above the calendar. Jamie closes the browser and leaves his phone on the table. Jamie has changed the settings of his Tvättstugetid application to sending him a reminder at 7:00 on the day of a booked slot. This is so that he can make the laundry ready in the morning.

Scenario 2
Persona: Sara Bergstrand
Family: Boyfriend and 1 child

Today is Monday, Sara has just woken up with the rest of her family when she receives a phone call. She is asked to work tonight. She has to see if her mom can babysit before she agrees because her boyfriend is meeting up with his friends tonight. After arranging for her mom to come over and answering her boss that she can come in she remembers that she has a booked slot to do her laundry tonight. This means that she has to change her slot to some other day instead. Sara opens a browser on her phone, goes to the Tvättstugetid website and logs in to her account. She can see her booked slot at the top of the page and presses the cross to unbook. Since the week is just starting she can see the whole week and the available slots. The evenings are usually pretty booked but mornings free which is good for her since she often works evenings and nights. Tomorrow morning is free so she presses Boka and can immediately see her new slot at the top of the page confirming that she has succeeded. She closes the browser and puts down her phone.

6.5 Refinement and Implementation Phase

During the coding of the prototype the code of the current application was used as a reference. Creating a layout for mobile devices was the purpose of the prototype and the rest of the system was kept the same, i.e. the log-in page and almost all of the back end. The system was built with the MVC framework described in Chapter 3. The *model* is the connection to the database, it either updates data or fetches it to pass it along to the controller. This part was kept unchanged.

The *view* is what the user sees and is what had to be changed for the prototype. This was mostly done with HTML and CSS but JavaScript was also used for functionality. The original code provided a very good basis for the construction and some parts were possible to reuse with small changes.

The *controller* is the connection between the model and the view, it gives each of them the data they want and can change the form of the data so that the model and view understand it. This is done in PHP in Tvättstugetid and small changes were needed in the making of the prototype because the new design needed some of the data in a different form.

During the implementation the prototype was further refined as questions and problems arose. The prototype was designed to work for the iPhone 5 screen size and be scalable for bigger mobile devices. It was decided not to include the code for desktop because it would add to the complexity and during the user testing session only the mobile layout would be tested. The basic layout and functionality was completed

before polishing the look of the prototype, this was to ensure that there would at least be a working prototype for the user testing.

Figure 6.21: A screenshot of the prototype on an iPhone 5 before polishing the appearance.

Figure 6.21 shows the final prototype. In the upper left corner there is a button for users that have multiple calendars to switch between them, the calendars are then displayed in a drop down list (see Figure 6.22). In the upper right corner the user can see their name and when they press that button they get a drop down list of actions such as *log out* and *my account*. The booking limit blocks are displayed above the calendars and show the bookings the user has made and how many more bookings they can make. If the cancelation limit for a slot has expired the user can not unbook the slot. Then four weeks are displayed, each below the previous one to show the upcoming four weeks. Finally, below the weeks there are links for the user to see the next four weeks or the previous four weeks and a link to go the current week.

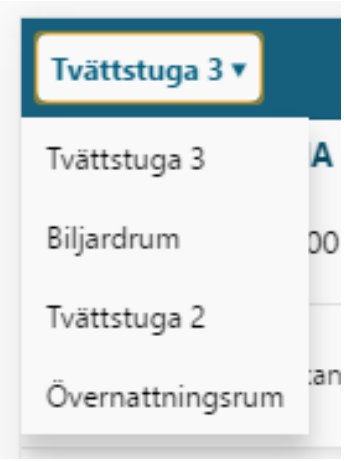

Figure 6.22: A screenshot of the drop down list in the prototype for switching between calendars.

When a booked slot is clicked information about it appears below the calendar, if it is not visible right away the page scrolls automatically to show the user that something has appeared. This can be seen in Figure 6.23. Due to time constraints nothing was done for its appearance and for a final product a connection between the information and the booked slot it applies to needs to be clear. The figure also shows that the user's past slots are visible showing them with a opaque green color.

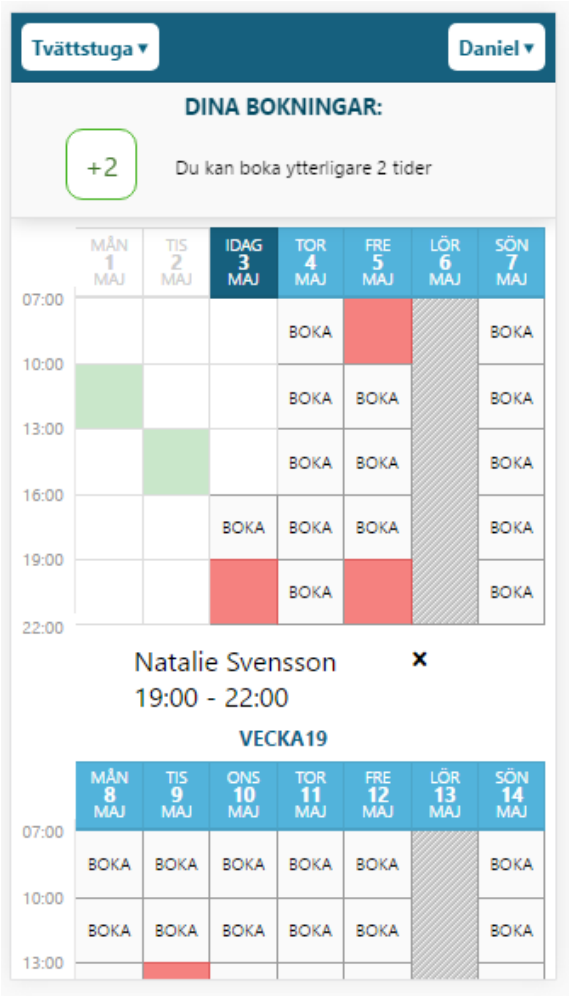

Figure 6.23: A screenshot of how information about a booked slot is displayed.

6.6 Final Evaluation

User testing sessions were planned to evaluate the prototype. The purpose was to investigate how participants felt about the prototype. The goal with the prototype was to create a better overview on mobile devices so the results from the user study on Tvättstugetid were also considered to be somewhat relevant and were therefore kept in mind during the analysis. The evaluation did not include as general questions as the user study since this time it was the mobile layout that was specifically being tested. The tasks were mostly the same as in the user study to provide a similar context for the evaluation. Still, a few changes were made to fit the prototype and new features. Appendix B shows the guide for the session. The following list shows what the tasks were meant to investigate:

A. **Book:** That users realize how slots can be booked.

B. **Unbook:** That users realize how slots can be unbooked.
C. **Dina bokningar:** That users understand the information *Dina bokningar* should display.
   C1. Date and time of booking.
   C2. How many slots they can book.
   C3. They can not unbook a slot that has started.
D. **Understanding availability:** That users understand which slots are available and which are not.
E. **Information about booked slots:** That users realize how to get more details about booked slots in the calendar.
F. **Switch between calendars:** That users realize how they can switch between calendars.
G. **Log out:** That users realize how they can log out of their account.
H. **Navigation between weeks**
   H1. The weeks currently displayed.
   H2. The next and previous four weeks.
   H3. Jump to current week.
I. **See past bookings:** That users discover how to find their past bookings.

Participants for the user testing were recruited in the same way as for the user studies, a snowball sampling through connections. One participant had also participated in the previous user study while the rest were not familiar with Tvättstugetid. For this session it was not a requirement that they had access to a shared laundry facility since the testing would only revolve around the application itself and not an investigation about laundry facilities. Table 6.13 shows attributes of the participants. There were nine participants in the user testing. They were either Swedish or Icelandic and those were the languages spoken during the sessions, except one that was in English. Each session took approximately half an hour. Due to technological problems it was not possible to test the prototype on mobile devices but instead the participants were provided with a computer where the application was simulated to be on a mobile device, having the screen size of an iPhone 5 and requiring similar actions as mobiles. This meant that the participants did not get the full experience of using the prototype as a mobile application but it was reasoned that the testing would still provide meaningful results. It was also noted that difficulties with navigation should be assessed with this in mind. The sessions were audio recorded as well as the screen being recorded to help with the analysis of how the participants navigated the prototype. Notes were also taken during the sessions.

Participants				
Participant	**Age**	**Gender**	**Nationality**	**Interview language**
1	50	Female	Icelandic	Icelandic
2	22	Female	Icelandic	Icelandic
3	27	Male	Icelandic	Icelandic
4	42	Male	Swedish	Swedish
5	31	Female	Swedish	Swedish
6	29	Female	Swedish	Swedish
7	25	Female	Swedish	English
8	34	Female	Swedish	Swedish
9	33	Male	Swedish	Swedish

Table 6.13: Attributes of the participants.

The participants got a description of a scenario they should imagine themselves in before the testing began. They were told that they lived in an apartment building with 10 apartments and had access to a laundry facility and a guest apartment. The system was set up so that they should be able to see a past booking made on the account they were signed in and that they had a booking that was currently going on, meaning that they would not be able to unbook it. Saturdays were unbookable but no reason was given to explain why, this was to see if the participants understood the difference between a slot being booked by someone else and when it is closed by the administration. Figure 6.24 shows the setup for the laundry facility. The participants were allowed to make two bookings for the laundry facility and three bookings for the guest apartment. The participants were asked to think as much aloud as possible and they were often asked why they performed a certain action or thought a specific thing.

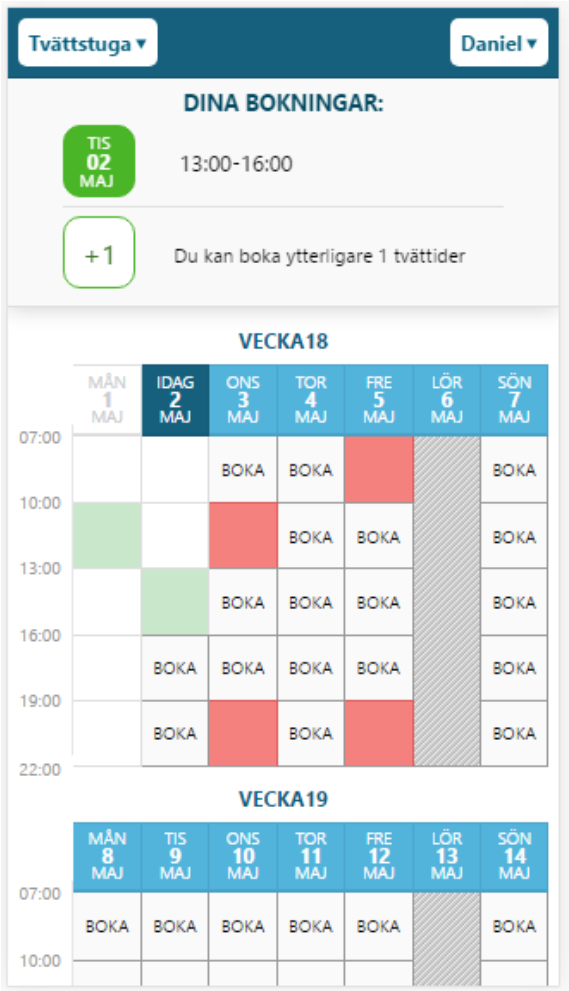

Figure 6.24: A screenshot of how the application looked like when participants where given access to it.

6.6.1 User Testing Analysis

The participants had no problems with booking and unbooking. All of them made the connection that red was unavailable which meant that someone else had booked. It was also noted by all participants that their color was green but a few of them were confused about the meaning of the more opaque slots that meant that they had already passed. They felt that the current slot should be more visible in some way but not look like the elapsed slots. Additionally, they also all understood that Saturdays were unbookable but when asked if they could book a slot on that day four participants tried to press the day to see if something would happen, two participants mentioned that it would be nice to be explained why when they pressed the day.

The participants accessed the functions in the dropdown lists easily, all of them understood how to switch between calendars and how to log out. When asked who

had made a booking for a certain slot they all realized that they could press the slot to see the information even though the slots did not look clickable. It should be noted that this might be because they were directly asked but if the task had not been so implicit the results might have been different.

While most users were able to find the account's past bookings easily the first three user test session took place on a Monday, meaning that a past booking on the account they were using was displayed in the previous week. Two of these three participants immediately answered the question *Do you know when the last time you did laundry was?* by saying *no* but the third participant realized that they should go to the past week. This might be case dependent because as one participant mentioned after being explained how they could access this information "*I might have realized if I had actually been the one that booked that slot.*" (Participant 3)

C. Dina bokningar

In the original mobile version of Tvättstugetid the *Dina bokningar* bricks were not available, meaning that users had no immediate access to knowing when their upcoming bookings were or how many bookings they were allowed to do. This was one of the issues that the results from the user study emphasized. Table 6.14 shows the results regarding the bricks. In the user testing eight of the nine participants easily understood the information from the bricks, even though a few of them still looked at the calendar to see their upcoming bookings. In the scenario they were given, they saw the calendar where their bookings were and the bricks simultaneously. A comment from one participant was "*It feels easier to look [in the calendar] because then you immediately understand when it is.*" (Participant 9). When asked to clarify they explained that it easier to perceive the time of the slot in relevance to what day and time it is currently if they look in the calendar than if they were to read it from the bricks.

Understood information from *Dina bokningar*		
Number of participants	**Yes**	**No**
C1. Date and time of booking	9	0
C2. How many slots they can book	8	1
C3. They can not unbook a slot that has started	9	0

Table 6.14: How well users understood the information *Dina Bokningar* should provide.

Even though all the participants understood that the reason for why they could not unbook one of the slots was because it was ongoing many of them had to stop and think and look at the time before being sure. It was concluded that this should be better clarified to the users, both in the calendar itself and in the bricks.

H. Navigation between weeks

In general the navigation between weeks was smooth but a few alternative methods were tried by the participants that were not possible, such as scrolling further and swiping to left and right to load more weeks instead of using the links. Table 6.15 shows how the participants navigated during the user testing. Even though three participants used the previous link rather than the link that jumps to the current date it is not considered an issue, because allowing the participants to choose between ways of navigating only adds to the experience. Especially since both links meant the same amount of work on behalf of the participant.

Navigation between weeks		
Number of participants	**Yes**	**No**
G1. The weeks currently displayed (scrolling)	9	0
G2. The next and previous four weeks (links at bottom of page)	9	0
G3. Jump to current week (link at bottom of page)	6	3

Table 6.15: How easily participants could navigate between weeks.

7

Results

This chapter presents the final results of the thesis. First it discusses challenges of designing a platform for sharing resources and then it presents a description of the final prototype.

7.1 Challenges

Research on different aspects of sharing has explored both challenges and benefits of the concept [1, 2, 7, 9]. They have discussed the opportunities technology provides in making sharing easier as well as identified both negative and positive consequences of it. Throughout the process of the thesis work notes were taken of any issues, regardless of their scope and complexity. If several issues could be grouped together and approaching them proved difficult because of their complexity the group formed a challenge. The challenges were then thought of in respect to other platforms and how they approach the challenge to see if the could be transferred to them. This will be further described in the respective chapter of the challenges. Five challenges of designing a digital platform for sharing resources were identified. They do not form an extensive list of challenges that might be met when designing a sharing platform but are challenges encountered in the case study. The challenges are the following: *Access*, *Coordinating and tracking booked slots*, *Privacy*, *Communication* and *Hierarchy of users*. *Privacy* and *trust* are established challenges [7, 9, 13, 47]. However, they are so complex, dynamic and impacted by the context that it is hard to describe them generally without a given context. In this thesis trust is included as a part of privacy.

7.1.1 Access

Access to a digital platform is of great importance since it reflects if and how people will use the platform. During the project work questions such as *where do users access Tvättstugetid?* and *what is their primary device (e.g. mobile or desktop)?*

arose. Additionally, the dilemma of users that are not comfortable with the technology required to use it was considered a big issue. These questions were categorized as challenges regarding access to the platform. The following three aspects of access were identified:

- Devices: Type of devices that will be used to access the platform.
- Location: Where can users access the platform?
- Alternatives: Alternative ways of accessing the platform.

Mobile applications are becoming increasingly popular as well as web applications that users can access anywhere they want [14–16, 48–50]. Applications where users can use their own devices can become more complicated in development than when a device is provided. When designing for multiple devices the designer needs to consider different operating systems, screen size and in some cases different input methods. In this aspect the devices that should work with the platform need to be decided. These could for example be smartphones, tablets and desktop computers. In this regard it is important to think about who will be interacting with the platform and where they would want to do it. Certain devices might be excluded if there is a valid reason for it. There is also a possibility of considering a certain type of device as a primary device but allowing full or limited access with other types of devices. If the platform should include a diverse group of users it would most likely benefit from allowing the users to use their own devices while supporting a wide range of them. Platforms such as Styr & Ställ [15] provide the user with a device while others such as Airbnb [48], Blocket [49] and Uber [14] require the user to use their own devices. Additionally, a combination of the two can be used. For example a gym might allow their members to book a slot in group classes through a mobile application but also provide a device at the gym.

The type of service the platform provides can have a major influence on how it can be accessed. In many cases the location of the service is too far away for it to be possible to expect users to go there every time they want to use the platform. In other cases, for example in the case study users are booking laundry rooms that are located in their apartment building. Meaning that if they were provided with a device located somewhere in the building going there to interact with the platform would not be out of the question. However, it can be argued that most people would rather want to be able to use their personal devices. This was the case with most participants in the user study, they mentioned that it was because they could do it where they are instead of having to go somewhere and therefore they would save time and energy. A platform that requires people to travel long distances only to interact with it would most likely not be very successful. Platforms like Styr & Ställ are an exception because people get immediate access to the bicycles after interacting with the platform, they do not book anything in advance. Another view on the location aspect is if users can choose where they access the platform, where will they want to do it? The environment the product will be used in can affect the design in significant ways, designing for usage in a busy environment such as on the bus or at a coffee house will produce different results than designing for use at home

or in a work environment. Because the environment affects how easily the user can concentrate which in turn affects how easily they can interact with the product [30].

According to OECD Statistics [51] 82% of individuals aged 16-74 in Sweden used the Internet daily or almost every day in 2015. In 2005 this number was 57%. This shows how rapidly computer and Internet usage is increasing. However, there are still some people that do not know how to use this technology and do not want to. Digital platforms often mean that the users are forced to own or at least know how to use the technology that supports it. Often this is not considered an issue, especially if it is believed that nobody in the target group falls within these constraints. This is evident in many platforms, such as Airbnb and Blocket. But what about platforms such as Tvättstugetid where it is vital that everyone is able to access it regardless of their abilities? There are a few possibilities to address this issue. If the problem is that users do not own a device the platform might provide them with it, either by giving each user their own item or by having a fixed location where a device is accessible to anyone. Of course, it might not always be feasible to spend money on individual devices so this needs to be assessed in relevance to other factors. If however, there are users that do not know how to use the system another approach is necessary. For some of the current users of Tvättstugetid this has been solved by making certain slots unbookable in the online version and have a paper calendar in the laundry facility where those who want to can book those slots instead. The problem with this approach is that the paper calendar and the application are not synced so neither knows any information that the other possesses. In other services users might do this through another person or having another option to access the service without using technology they are not comfortable with. Many systems see the benefit of offering both types of service, such as a hairdresser with an online booking system but also takes booking via phone. However, this way of providing alternative ways for users to access the service might prompt a feeling of exclusion since these users are using a special version of the platform which is only for a small group of people. This also means that they only have a limited access to the service (e.g. only certain days/times). In an article by Mary Follette Story [52] she talks about how usability can be maximised. In other words, how to approach the subject of designing to include as many users as possible. She mentions that even though this kind of design can present various options to customize each user's experience, all the options should preferably be presented equally.

7.1.2 Coordinating and Tracking Booked Slots

In the case study, users considered easy access to information about their upcoming bookings a part of providing a good overview. It gave them an immediate idea about their status when they opened the application. This feature was not included in the mobile version of Tvättstugetid and during the user study the absence was noted by several participants. It emphasized the importance for them to know what they have booked and any relevant details about their booking. Other means of being able to

coordinate with their calendar application for various reasons were also mentioned, such as sharing with other family members when the next upcoming slot was or organizing their daily schedule. Finally, most participants mentioned notifications as a feature they would like to see in an application like this. This lead to the forming of *coordinating and tracking booked slots* as a challenge and is divided into three aspects:

- Booking information.
- Coordinate with external services.
- Reminders.

Users need to have an easy access to their booking information. This is what tells them what they have booked, when they have booked it and other details about their booking. This is something that can be made more efficient with information visualization to condense the information they need to know while still having it understandable. Desktops have more screen space to work with which makes this task easier than on mobile devices that have smaller screens. As Yoo and Cheon discuss in their article [53], the type of information the application shows and the connection between the types needs to be investigated to be able to create a layout that is coherent. For example, they suggest applying a sequential layout where information is not very connected and a radial layout for information that has hierarchy. They further emphasize how animation can be used to help explain connection between elements in the layout. The booking information needed is highly dependent on the context, Uber for example, shows the user a map of the route they are driving on during the trip as well as an estimated time of arrival while applications for selling/buying between individuals need a different approach. Shpock [50] for example, provides their users with a list of items that they are in the process of buying or selling along with other relevant information.

Coordination with other applications can help the users put their bookings in context with their schedule. These could for example be calendar applications such as Google Calendar. This would also allow users to share their bookings with others without everyone having to be a part of the platform. As Neustaedter [6] discusses, this might be useful for them when they are booking something that affects others, for instance in Tvättstugetid other members of the household might find it useful to know when the next upcoming booking is.

In some cases users might want to be reminded of their upcoming bookings. There are a few possibilities of how to remind them and each can be appropriate in different contexts. A common way for mobile application is to send a native notification or an alert to the phone. This is a very popular approach and is used by various applications, not just sharing platforms. A few examples are Facebook, Boka Tvättid [16] and Gmail. With systems that are not native but perhaps used through a browser another way is necessary. With these external services could be used, such as emails or SMS. Reminders could allow the user to relax and not having to check their booking information regularly because they know they will be reminded of it.

7.1.3 Privacy

An important issue in online platforms is privacy. Issues in the case study regarding privacy were mainly about how much information to show on booked slots, weather it is necessary to show the name of the user or if only showing that the slot was booked was enough. Furthermore, it was considered how the fact that the users were all neighbors in the same building affected the privacy needed in the platform. In general, users should not have to share more information than necessary with others. The perception of what is important of course differs between people as well as what they are ready to share regardless of its importance. According to Dourish and Anderson [47] the focus should be put on explaining to users the consequences of sharing certain information can have rather than enforcing boundaries set by the platform. The type of information about the user is divided into the two following categories:

- Personal information.
- Platform activities.

Personal information could for example be the user's actual name, their profession or contact information. It is basically anything that has to do with their real life persona. This does not mean that the users should not share *any* personal information with others but rather that the context of the platform can help identify what is necessary for them to share, and perhaps allow them to additionally share what they *want* to. But it is also important that the users can trust each other so enough information needs to be provided. Usernames are an option that is often used in online platforms. They allow the user to easily distinguish between their online persona and their real one. Users of Tvättstugetid are likely to have access to each other names in some other way, for example on mailboxes, but in some apartment buildings this might not even be the case. Additionally, they might not want to share their email address or phone number with their neighbors. In Tvättstugetid it is left up to the administrators of each account to decide how to identify their users, they might use the user's name or they might use the apartment number. This allows the administrators more control of how the product is used. This approach makes the platform a tool that others can tailor to what they need. However, it might also produce other issues, such as who can be trusted to not show too much information. Some platforms ask for certain information to be able to verify the user. Uber requires the user to enter their payment info, this is not shared with other users but is used to build trust between users. Since rides are automatically charged the user providing the car does not need to worry about getting paid. They further build trust by having a rating system on both drivers and passengers which users can use when deciding to share rides. A similar rating system is used in Airbnb. In a platform were no interaction is required between users (e.g. Styr & Ställ) this becomes less of an issue, since users do not need to know anything about each other, but the information is only for the platform itself to ensure that the users are reliable.

Managing the privacy settings of the user's platform activities can be tricky. That is, to decide what activities should be visible by other users and what not. In many platforms others can see if the user is logged in or not, this is often the case in applications where direct communication is the goal, for example on Facebook and Skype. But for other applications this might be considered unnecessary or even undesired. Users might not want to share with others when they are logged in to their public transport application or health care platform. In booking systems this could mean the question of weather or not to show who has booked a slot, because it might be enough to only show that the slot has been booked. Showing another user's information might allow for the users to contact each other for various reasons, for example if someone has forgotten something in the facility or if they want to negotiate a compromise. It could be argued that this is more likely to be needed in systems where multiple users are using a service provided by a third party. In those cases the users might form a kind of community where everyone would gain from the service being well taken care of and they are more likely to want to interact with each other. In platforms where individuals are cooperating with other individuals (e.g. Uber, Blocket and Shpock) it might be enough that only the people involved know the details. In many sharing platforms the users need to see some kind of activity to know that it is being used and how busy it is, if they are selling something they want to know that people are viewing their post and if they are booking time they want to know how easy or hard it is to find a suitable time. In any case, it has to be decided how much information is displayed in addition to availability.

7.1.4 Communication

In sharing platforms some kind of communication is likely to be wanted. Especially if the sharing is between individual users rather than when the service is provided by some kind of company or organization. In the current version of Tvättstugetid users can leave comments on their own bookings in the calendar. The purpose of this was for example thought to be so that they could notify others that they would not be using all the available machines. However, it became evident that most users did not notice this in the application and some even wondered if they would ever use this feature in the context of Tvättstugetid. However, a few participants mentioned that another way of communicating might be useful, for example to inform their neighbor if something had been forgotten in the facility. It became clear that the purpose of the communication had impact on ways they would like to do it and if it should be public or not. To summarize, the following are considered types of communication in a sharing platform:

- Between users.
- Messages from owners.
- Contact through another media.

The purpose of communication between users can vary, for example users might want

to agree on time and place, price or even just have a discussion about something. This type of communication is closely connected to the privacy chapter above and it is important to remember to think about the reason behind user information that is accessible by others. The purpose of the communication helps decide if it should be public or private. Users sharing personal information would most likely want to keep that private but when users are allowed to bid on a product or service they might need to see previous bidding to be able to assess the situation. In the user study for Tvättstugetid it was mentioned that they might want to communicate with their neighbors if someone has forgotten something. This is an example about information that only the users involved need to see. However, if they would want to inform others that they will not be using one of the machines in the facility they would want to do so publicly. Many platforms might need to provide both a private messaging function and a public discussion feature while others would only have one or even neither option. In Shpock this is done by providing users with two options when viewing an item for sale, to either ask a public question or send a private offer. This way the users can decide what suits them. In Airbnb references of apartments are visible to everyone but messages between owners and prospective tenants are private.

The owners often need to pass information along to all users. In peer-to-peer applications this might be less of an issue since they do normally not need to inform a group of user of anything. This is more likely in applications where the service is provided by a third party and multiple users have access to it. The owner of the service often need to pass information along to all users for example if something is broken and therefore unavailable, if they want to change the rules that apply to the service and so on. One way of doing this is to send emails but in many cases it would be better if the information is displayed in the correct context so users can better grasp it. That is when showing that something is unavailable, to also show why it is. Rule changes might be harder to manage since the users need to clearly see that something has changed but they are not likely to check the rules regularly. Some kind of notification that stands out would indicate the change to the user.

Finally, for some kinds of interaction it is easier or even necessary to have a more direct communication, for example via phone. Furthermore, when users are getting access to a service they often need to meet the owner in which case they need to physically go to a meeting location. Arranging these meetings can be easier through a different media and might make the platform less complicated. This is often done after initial contact has been made through the platform.

7.1.5 Hierarchy of Users

A sharing platform can facilitate different types of users. From the start it was clear that there were two types of users in Tvättstugetid, the owners of the facility and tenants that have access to it. This created an interesting conflict between

who controlled what, for example some participants said that they liked that the application allowed them to make two bookings while in their current system they were only allowed to make on. They did not realize that this was something that the owner would still control if they were using the application in their apartment building. On the one hand there could be owners or managers of the service or item that decide that have control over how the item or service will be used. On the other hand there are the end users that want to use the service. The hierarchy of the users in a platform defines two factors:

- Types of users.
- Control.

Many sharing platforms are built on this kind of division between users since there is usually someone who owns something and others that want to buy, borrow, rent or get access to it in some way. The owners can either be individuals or a company/organization. Airbnb and Blocket are platforms where both owners and end users are individuals while Tvättstugetid and Styr & Ställ are examples of platforms with services owned by companies or organizations. The owners need to get some kind of control over who they allow access to their service, when, how much it costs and so on. In similar fashion the user also wants to have some control of the same things. This can be very difficult to balance so the platform does not become chaotic. Both user groups need to be content if the platform is to become successful because it can not work without one of them.

In Tvättstugetid the owner controls what slots are available and how many bookings an end user can make, however the end user can choose which slots they book. This means that both user groups have some control but the owner has more of it. A similar balance is kept in many platforms where users can for example buy items of others such as on Blocket and in Shpock, there the seller suggests a price which the buyer can try to negotiate, but the final decision always lies with the seller.

7.2 Prototype

After analysing the results from the user study the decision was made to put focus on improving the overview and navigation on mobile devices. The prototype was designed with this in mind.

Tvättstugetid is implemented with the MVC design pattern. Since the prototype was built on top of the current version it was possible to use the *model* and *controller* while changing only the *view*. This was done with HTML, CSS and JavaScript.

7.2.1 Features

The features that were included in the prototype were decided with help of the goals stated in chapter 6.3.4. The features were chosen to provide an idea of how a final design could look like so all basic functions were included, such as *booking*, *unbooking*, *tracking booked slots*, *seeing available and unavailable slots* and *navigation between time periods*. Some features were purposefully left out to keep the prototype simple and so it would be easier to evaluate each feature. For example, commenting on booked slots and messages from the account administrator. Other functions were included to be able to create a context for the user testing which was realistic and they could easily emerge themselves in. For example the participants could see more information about booked slots, specifically see who has booked it.

7.2.2 Design

Tvättstugetid can be categorized as an application with transient posture. Meaning that it is only used for short periods of time at once. This allows for more freedom with colors and objects that demand attention from the user but in turn it means that the application should be easy to use and the user should be able to use the most important features instinctively. The design of the prototype is flat and it was aimed to keep it as simple as possible. The most frequently used features were kept where they could be immediately accessed by the user. Distinguishing colors were used to differentiate between slots booked by the current user and by other users. Animations were also used to display connection between elements such as showing a booking move from the calendar to the user's booking information bricks.

Figures 7.1 and 7.2 show a comparison of the mobile layout of the current version of Tvättstugetid and the prototype.

Figure 7.1: The mobile layout of the current version of Tvättstugetid.

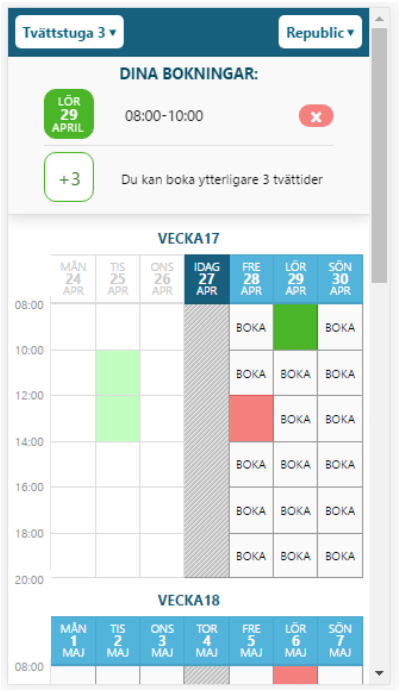

Figure 7.2: The mobile layout of the prototype.

7.2.3 Evaluation

The evaluation of the prototype was considered a step towards deciding the final design so there were specific areas that were to be investigated during the user test. The user test was aimed to investigate whether the prototype was easily understood and simple to use. Furthermore, the participants were asked to reflect on their general feeling of the prototype to get insight into how they experienced the prototype. The user testing evaluation indicated that creating a layout with a better overview and easily understood navigation had been successful. Most of the participants in the user testing mentioned that they thought the prototype provided a good overview of the coming weeks before being presented with the current version of Tvättstugetid. Additionally, they considered the booking information above the calendar to be useful. However, there is further work that needs to be done before the design is finalized.

8

Discussion

In this chapter different aspects of the project are discussed and reflected upon.

8.1 The Process

The original plan for the process was to have three iterations. Quickly it became clear that this was not feasible. On one hand it would have meant less time for each part which would potentially lead to lower quality results. On the other hand it was considered that by iterating through all the phases three times, each phase would lose their value because some of them would be better suited for the early iterations and some of them for later ones. Therefore, it was decided to go only once through the phases but reflect on each of them before starting the next phase to make sure that they had produced what was desired.

The goal directed process and the phases that it includes suited very well with the project and lead to a continuous process with a clear direction. Almost everything went according to plan but in some cases two phases emerged and were worked on simultaneously. Some of the methods used proved more valuable than others. The interviews along with the think-aloud protocol in both the user study and the user testing were extremely beneficial. The results from them are what shaped most of the rest of the project. When deciding on how to perform the user study other means of getting information from the potential users were considered. A focus group for instance would likely been equally as useful. However, the interviews allowed for more freedom for each individual to talk about their experiences and opinions. A focus group might not have allowed each individual to express themselves as much. To evaluate both the current version of Tvättstugetid and the prototype the participants were asked to perform specific tasks and answer questions about the system. By asking them directly it might have forced them to think in a way they would not have thought otherwise, meaning that it might influence how they interact with the design. This was recognized before performing the sessions and to try to minimize the effect of this they were encouraged to talk freely and only asked if it seemed that they were not going to mention a specific subject. Furthermore,

the participants were provided with a realistic scenario of why they should want to perform the actions to make the actions feel more natural.

A KJ was done after the user study had been analysed and was supposed to summarize the results, identify goals and bring up possible problem areas and solutions. The groups that were identified did aid in understanding the scope and context of the application but the conclusion was that it did not add very much to the end result. Perhaps it would have been better to do it with more emphasis on brainstorming solutions to problems that had already been identified.

When the research had been done and analysed, that is the background and literature study as well as the user study, the next part of the project was to come up with different ideas. The main method for this was to do sketches of different ideas and then work further on the ones that showed potential. The sketches, both paper and digital, helped to visualize the options and provided a means for discussion with the owners of Tvättstugetid. They ensured that the implementation phase went as smoothly as possible because it had been made clear what should be implemented beforehand. After a solution had been chosen scenarios were written to see how a user might use it. However, during the discussion of the sketches many of the details had already been discussed so the scenarios did not help in discovering anything new. To be fair, Tvättstugetid is a fairly simple system and the most common use scenarios could easily be identified and these where what the scenarios were written about. The scenarios could have been made to investigate less frequent actions such as changing the password or checking who has booked a certain slot and would then be more valuable.

8.2 Results and Future Work

In this chapter the final results are discussed as well as possibilities for future work on them.

8.2.1 Challenges

The objective of the thesis was derived from the platform rather than chosen before finding a suitable platform. This makes it questionable if the platform was ideal for exploring challenges in designing platforms for sharing resources. The benefits of having Tvättstugetid as a case study are that it has been used for several years and there were known problem with it which provided a good starting point for the research. It was also easy to find potential users of the system since it is for a mundane task that most people do regularly. On the other hand it is a relatively simple platform when compared to others such as Airbnb, Uber and Blocket which might limit the discovered challenges when designing it.

The challenges that were identified throughout the process may be generalized to similar platforms. They describe general issues that might affect sharing platforms. Literature named *technology platforms*, *trust*, *creating and sustaining community*, *exchange models* and *societal and economic impacts* as issues to be addressed when sharing for local communities [9]. Technology platforms, trust and exchange models are all a part of the challenges identified in this study and therefore support the results. They relate to access, privacy and hierarchy of users respectively. Since Tvättstugetid is used by neighbors they are already a community and have motivations to use the platform. Additionally, the study did not investigate external factors such as societal and economic impact the platform might or could have. In this regard a more complex platform for the case study might have suited better to shed light on these issues.

Since the case study was only with one platform it provides a limited idea of other platforms. This means that even though other challenges arose during the project work they were more specific towards this platform to be generalized in the results. However, there already exist many sharing platforms of various types that are accessible to anyone, e.g. Airbnb, Uber, Blocket and Styr & Ställ. They could therefore be investigated to some extent without being involved in the designing process of them. This kind of external research did help approaching the challenges from different perspectives and further support the identified challenges.

Future work on the challenges would include a study on the platform for a longer period of time as well as doing an in-depth investigation on other platforms. This would approach the subject from other directions and would help making the results more general. Another approach would be to research inter-connectivity between the challenges to see how they affect each other and rate their importance based on the type of platform.

8.2.2 Prototype

The results from the user study pointed the project in the direction of designing an alternative layout for the mobile view. The current desktop layout already gives a good overview and many participants mentioned that they would mostly use their phone for this application. It was important to maintain consistency between the desktop and mobile layouts so that users using both versions still feel that they are using the same application as any cross-platform application should do. This could be done by maintaining the elements and showing information in the same way even though alterations were done in the layout and interaction.

The goal with the prototype was to improve the navigation and understandability in mobiles in order to increase user experience. The user study gave a good idea of what the participants were looking for in an application like this and first and foremost it should be simple and easy to use. This was done in accordance with

Cooper's term of inflecting the interface [30], the most obvious functions were kept visible such as booking, unbooking and accessing booking information while other functions were put in drop down lists to save screen space and not interrupt the flow of the user. The participants understood easily where to find certain features, e.g. how to log out and how to switch between calendars even though they were hidden in drop down lists. They were also able to perform the most common actions, e.g. booking and unbooking, without problems.

The prototype was designed with the user testing in mind so the functionality needed for the testing was implemented first and a focus on the aesthetics was put second. This meant that is was clear from the start what was most necessary to implement and what could be faked in some way so that the testing scenario worked. Due to time constraints some features were purposefully left out of the prototype that would need to be included in a final design. These features were booking history, commenting on slots and the message board run by the administrator. Furthermore, one feature was not completed entirely. That is, how extra information about a booked slot was displayed. In the prototype, the information appears below the calendar and an automatic scrolling animation was added to point to the information but nothing else was done to visually connect the information to the slot it originated from.

In the prototype the user could only see their own past bookings and they were only accessible in the calendar. This is a subject that needs to be explored further. Users can have different reasons for wanting to see their past bookings. If they want a summary of a specific time period it might be better do display the past bookings in a list somewhere in the application. If they just want to see when the last time they did their laundry was they might just want to have a quick glance at the calendar. Additionally, it would be necessary to consider if other users' history should also be available or only the user's own. This means that it needs to be considered if past events should be available in the calendars, and if not then if users should actually be able to go to previous weeks since there will be no information displayed.

In the current version of Tvättstugetid it is possible for users to comment on their bookings. Their comments are then visible by everyone else in the calendar. This was excluded in the prototype, mainly for the reason that few participants in the user study realized that this was a possibility and questions arose to weather this was a feature that was actually used. One of the suggestions for why users would use this feature was to let others know that they would not use all the machines in the facility. But this kind of behaviour would most likely be heavily influenced by the people who live in the building, in many cases people might just want to have the facility to themselves and do not care enough about their neighbors do go through the extra work of letting them know what they could share their slot. Nonetheless, it can be argued that providing this option would leave it up to the users if they wanted to use it and it could potentially be a valuable features for another type of service.

Messages from the account administrators are displayed at the bottom of the page in the current version of Tvättstugetid. This needs to be more accessible to the users since they might not look there regularly, especially in the mobile version. An idea of notifying the users when a new message was sent was discussed. Then the messages could be accessed through the users drop down list rather than taking up screen space all the time.

Some of the visual design did cause confusion for the participants because edge cases had not been considered, for example that the current slot look the same as past slots which lead them to understanding their booking information differently. Furthermore, the design of the prototype is flat but adding skeuomorphic elements has been considered, for example to visualize booked slots and difference between the user's slots and slots booked by other users (see Figure 8.1). Counter to flat design, Gibson's affordance theory emphasizes the importance of indicating to the user what is clickable and what is not. While this might be necessary in some cases it did no seem feasible to show affordances in this interface since there are a lot of clickable items in the calendars which would create clutter and items might get harder to find.

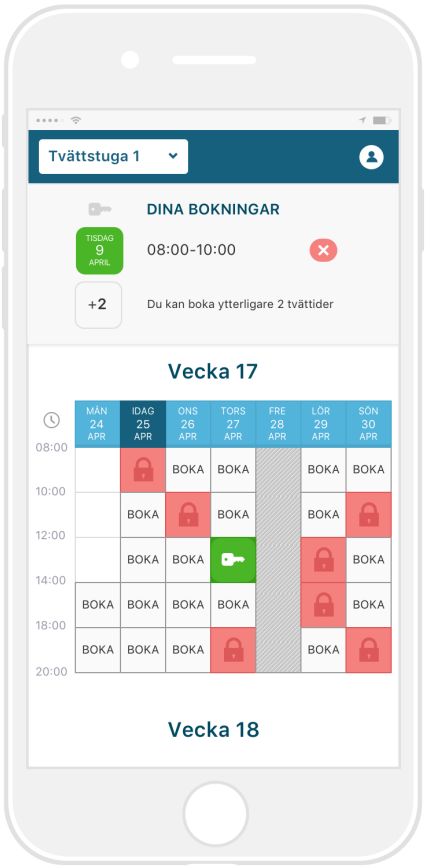

Figure 8.1: A digital sketch of how booked slots could be visualized.

The testing of the prototype lead to primarily positive results even though there were of course some issues. It is important to note that testing all possible scenarios was impossible. The account used for the testing was made to be fairly active but still with many available slots, this was based on research on current accounts in Tvättstugetid and how active they were. This means that extreme cases were not tested, such as a very active account where it is difficult to find slots or accounts with hardly any activity. Investigating user experience over longer period of time and with various accounts would be necessary to get a better idea of how it is perceived in the long run.

To allow the product to facilitate more types of usage other features might be explored, such as allowing multiple users to book the same slot or allowing users to control what kind of calendar view they get (i.e. week, month or a list of the next available slots). For example, a user booking equipment to go skiing in two months might prefer a monthly view while in other cases a weekly view suits better. Another possibility would be to connect the application to a service that controls who can use the service and when, for example automatic locks on doors that would only open for the person who has booked the current slot.

8.3 Ethics

One of the ethical issues raised in Chapter 1.4 was about how much information should be displayed about other users. This is also addressed as one of the challenges in designing a platform for sharing resources. Tvättstugetid approaches this partially by allowing the administrators of each account to choose how the users are identified, they could for example choose to show full name, first name or just the apartment number of the user. They are not given any guidance about what to choose but since they are connected to the end users in real life it is trusted that any dissatisfaction can be discussed outside of the platform. In this way Tvättstugetid differs from platforms were the sharing is between individuals, because the responsibility is transferred from the platform itself to the account administrator. In addition to this it is worth mentioning that showing who has booked a slot might not always be necessary.

Balancing the control of the users and owners is a hard task. Neither should be able to take advantage of the other but both need to feel that they are benefiting from the cooperation. The account administrators of Tvättstugetid have more control than the end users, they can specify when available slots are, how long they are and how many bookings the end users can make. The end users in turn can choose from the available slots and use their bookings for what they want. The limits do influence how the platform is used, users that are only allowed one booking at a time for their laundry room will most likely not book many weeks ahead. This means the same for all the user of the account which makes it likely that upcoming slots are more likely to be busy. If users had a higher limit they might be inclined to book a few

weeks at a time.

The inclusion of people that do not want to use the technology is an extremely difficult task. Tvättstugetid is a type of service that must be usable by everyone. A digital platform provides a lot of benefits and opportunities that something like a paper calendar or a lock table can not compete with. This is what makes it appealing to the majority of potential users. However, people can not be forced to use it. Even though it was tried to keep the prototype as simple as possible that is not enough to convince people to use it. There might be some options to facilitate all users, for example connecting a lock table to the platform or making it possible for users to write on a paper date and time of when they want to book. This would however severely add to the complexity of the designing. Instead, Tvättstugetid relies on their clients to decide how to approach this issue if necessary.

9

Conclusion

The purpose of the thesis has been to explore the design of digital platforms for sharing resources by using a specific platform as a case study. The case study was a booking system for booking laundry facilities in apartment buildings called Tvättstugetid. When defining the focus of the project the following questions about these kind of platforms arose *What is their incentive to use this platform and where will they be using it? What exactly do they want to do and how should they do it? Are there any limitations or rules about how and when they use the service? Do they need to verify themselves before being able to book the service? How can other users be trusted? Who is responsible if something breaks?* To summarize and generalize these questions the proposed research question was formed:

What challenges might arise when designing a digital platform for multiple users to share resources?

To answer the research question the focus was put on the design process of a prototype for an alternative solution of Tvättstugetid. The first step was to interview potential users of the application and enquire about how they would use it and how their laundry facility situation was. The user study helped answer the supporting questions and discover in what way the context varies between users and what is mutual between them. Then the project work focused on designing the prototype. Along the way problems and speculations were identified and these were grouped together and made broader to form the following challenges:

- **Access:** Aspects that need to be considered are how the users will use the platform and what devices does it support. From where the platform will be accessible and possibly alternative options for it to be accessed.

- **Coordination and tracking booked slots:** Users need to have easy access to their booking information and they might want to coordinate with external services such as Google Calendar or share their information with others. Furthermore, they might want to be reminded of upcoming bookings, e.g. in form of a native notification, email or SMS.

- **Privacy:** Considerable thought should be put into what information is acces-

sible by others on the platform, this regards both personal information of each individual user and their platform activity.

- **Communication:** Different kinds of communications might need to be supported, such as communication between users, messages from the owners of the service and communication through other media than the platform itself.

- **Hierarchy of users:** Platforms for sharing resources are based on cooperation but users can have different roles in the platform, mainly owners or managers of a service or users who want access to the service. Furthermore, these user groups might need to be able to control different aspects of the transaction.

The main validity threat with these results are that they are only based on one case study so it can not be said for sure that these challenges apply to all kinds of digital platforms for sharing resources. They do however, provide a good start for those who might like to design these kind of platforms.

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A

Interview Guide

Part I: Introduction to the project and a description of the purpose of the interview

Part II: General Questions

1. How does the building organize the usage of the laundry room, how do you book slots?
2. How many washing machines do you have access to and how many dryers?
3. Who maintains and cleans the laundry room?
4. How many children and adults live in your apartment?
5. How often do you do your laundry?
6. Do you have preferred days and times to do your laundry?
7. Is it possible to have a washing machine in your apartment? Do you have one?
8. How many slots are you allowed to have booked? Do you use all of them?
9. How far ahead do you book slots?
10. Would you do your laundry more or less often if you had/didn't have your own washing machine?
11. Who do you contact and how if something breaks in the laundry room?
12. If you compare having a shared laundry room vs. having your own washing machine, what are the benefits and flaws?
13. Are there any written rules about the facility, what are you allowed to do and what not?
14. Are there any unwritten rules that most or all neighbours follow (e.g. allowed to remove things from machine if it is done, amount of time something can hang up to be dried)?
15. Do you use any similar booking service regularly (e.g. Uber, Styr & Ställ,

something you and other users have access to but need to book a time to have access to)?

Part III: Think-Aloud Protocol
A brief description of the system and the participant is told about the scenario they should imagine themselves in.

- Do you know how many bookings you are allowed to have at any given time? How do you know?
- Book a time sometime next Sunday.
- When was the last time you did laundry?
- When is your next appointment for the laundry facilities?
- Unbook the slot on Sunday.
- You are going on a holiday on Monday so you need to do some washing on Saturday, can you do it between 11 and 15?
- Book a time sometime on Wednesday, Thursday or Friday next week. Why did you pick that slot? Why can't you book a slot on the other two days?

Part IV: Follow Up Questions

1. What do you think about the application?
2. In what way is Tvättstugetid different from the way you book your laundry facility?
3. What benefits can you see with using Tvättstugetid compared to how you currently do it?
4. What flaws can you see with using Tvättstugetid compared to how you currently do it?
5. What device do you imagine you would usually use when you wanted to book a time slot (e.g. computer, tablet, smartphone)?
6. How would you like to be able to keep track of times you have booked (e.g. a notification on mobile, use Google Calendar)?
7. Where do you imagine yourself to be when you would use Tvättstugetid (e.g. at home, on the bus, at work, etc.)?
8. If your building was using Tvättstugetid, what would you do if you were unable to use your own devices to book a slot (e.g. devices were broken, no Internet)?
9. Are there any functions or features you imagine would be useful in an application like this?

B

Evaluation

Part I: Introduction to the project and a description of the purpose of the user testing session
Inform the participants that the prototype is not a finished product and all comments are very appreciated for further development. The more they say the more I have to write about so it would be very helpful. The participants are allowed to and encouraged to start exploring the prototype on their own to get a feeling of how it works before being asked to perform specific tasks. When they are done exploring by themselves part 2 starts.

Part II: Tasks
A brief description of the system and the participant is told about the scenario they should imagine themselves in. Remind them that when they are asked questions about the system they should think about it as them being in that scenario using this application and that they should try to say everything they think out loud.

Scenario: *You live at Testgatan 2. There are 10 apartments in the building and you have access to a laundry facility and a guest apartment.*

1. Tell me what you can see, how do things work?
2. Do you know how many bookings you are allowed to have at any given time? How do you know?
3. What day is it today according to the application, how do you know?
4. Book a time sometime next Saturday. Why can't you book?
5. Book a time sometime on Sunday.
6. How many upcoming bookings do you have now? When are they?
7. Unbook all your bookings. (When they say they can not unbook the slot that has started ask them why they think that is.)
8. Do you know when the last time you did laundry was?
9. You have friends coming on Friday, Saturday and Sunday in Week 23, can you book the guest apartment for them?

10. Go back to the current week?
11. Who has booked the guest apartment this week?
12. Now book 4 slots for the Tvättstuga of your choice, what happens?
13. What would you do if you wanted to log out of your account?

Part III: Questions and Discussion

1. How do you feel about the application?
2. Is there anything you did not understand?
3. Show previous version of Tvättstugetid and ask them to compare them.
4. What are your thoughts on the amount of time displayed at once? (note to moderator: that there are 4 weeks at a time, is there another number they would prefer.)
5. Can you imagine another service that this booking system would work with?
6. What do you think about how booked slots are visualised? Can you distinguish between who has booked?