Using navigational tools to get around in a city with a movement-impairing disability: An autoethnographic study

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Abstract

This thesis is an autoethnographic study about how a person with a movement-impairing disability deal with everyday events. Having a movement-impairing disability means more challenges, especially when travelling, which requires more planning. The researcher and participant in this thesis have cerebral palsy, which affects their fine motor skills to some degree, and causes lower mobility which in turn causes them to spend more energy than others on any activity, such as for example walking. Two field trials have been conducted where some common events take place, such as meeting a friend for a coffee and walking to the boat to travel back home to visit family. During the field trials, voice-recorded notes were made and were later discussed. The thesis also includes suggestions to improve the app Skyss Reise [27], which could later be evaluated by other means to see if the suggested improvements would benefit other users.

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Chapter 1

Introduction

Getting around in everyday life is usually an automatic and unconscious activity bringing one to the next thing on the to-do list, but this is not the case for everybody. For many people, getting around can be pretty challenging and requires more planning than what most people put into travelling.

This thesis is an autoethnographic study with a participant with cerebral palsy, which affects their fine motor skills to some degree, causes lower mobility which in return causes them to spend more energy than others on any activity such as just walking. Two field trials have been conducted where some common events take place, such as meeting a friend for a coffee and taking the boat home to visit family. During the field trials, voice-recorded notes were made and were later discussed. The thesis also includes suggestions to improve the app Skyss Reise [27] which could later be evaluated by other means to see if the suggested improvements would benefit other users.

1.1 Motivation

On a professional note, the primary motivation behind this thesis is to highlight how disability in research is lacking and make the views of a person with a disability more accessible. Also, giving an example of how autoethnography can be used in user experience design. The study is set in the researcher's local area, and some of the navigational tools are made for local use. Keeping it local allows the study to contribute positively to the local community.

On a personal note, I am disabled. I was born with *cerebral palsy* (CP). This condi-

tion can occur when there are problems with brain development and causes problems with coordination, and movement [22]. I have therefore lived my entire life trying to figure out how to live as normal and independent as possible. When I was in high school, my dad had a brain stroke. So I have seen first-hand how it is for a person to adapt when they become disabled. I have also seen how contrasting a disability can be for different people, and how what may be an aid or be useful to one person might be the complete opposite of what the other person needs.

When I first moved to Bergen to start University, I remember looking up all the places I was going or could be heading to on Google Maps. Then, I would use the satellite function to see how it looked outside the area I was going to. What would be the best way to get there? If I decided on a cab, where would be the best place to ask it to park? Would the route be challenging and add to the travel time? There are many factors to consider when trying to get around in a city with a disability. It also takes so much time and effort to plan, and one always has to be one step ahead.

1.2 Research questions

In this thesis, the following research questions will be attempted to be answered:

RQ 1: How do the smartphone as a navigational tool support wayfinding and independence for people with movement-impairing disabilities?

RQ 2: How can autoethnography be used to explore the accessibility and user experience of navigational tools?

Depending on the result of the autoethnographic study, it would be interesting to see if it is possible to come up with suggestions as to how the navigational tools can be improved.

RQ 2.1: Are there any improvements that can be made to the navigational tools considering the result of the autoethnographic study?

1.3 Contribution

The contributions of this thesis include broadening the range of research on people with disabilities and giving an example of the challenges of a specific movement-impairing

disability. The evaluation of the travel planner app Skyss Reise [27] is based on the researchers own experiences and provide suggestions for improvements to the design. Discussion of the use of autoethnography as a scientific method and how useful it can be for the research on disability and accessibility. Finally, since the Skyss Reise app is an app for the local public transport company, the suggestion to improve the app contributes to and could help improve locally.

1.4 Structure of Thesis

The structure of the thesis goes as follows:

- *Chapter 2 Background:* Details the related theory of this thesis. Section 2.1 presents the definition of disability and how the term disability will be used in this thesis. Section 2.1.1 mentions disability used in scientific studies. Section 2.2 describes the broad field of Human-Computer Interaction (HCI). Section 2.2.1 explains the design process of user experience (UX). Section 2.2.2 explains accessibility. Section 2.2.3 introduces the concept of universal design where one try to include everyone when designing. Section 2.3 is about smartphone navigation and GIS. Section 2.4 is a description of the participant.

- *Chapter 3 Methodology:* Focuses on autoethnography as a research method. Section 3.1 describes autoethnography. Section 3.2 points out the positive sides of using autoethnography. Section 3.3 discusses the criticism of autoethnography. Section 3.4 gives examples of autoethnography used in scientific studies. Section 3.5 explains why I decided on using autoethnography.

- *Chapter 4 Methods and tools:* Explains how the field trials have been conducted and the different tools such as the applications used during the field trials. Section 4.1 explains field trial as a research method. Section 4.2 details when the field trials was conducted and what tools were used to record and note the process. Section 4.3 is a description of the Bergen light rail. Section 4.4 describes Bergen Storsenter, a shopping mall in Bergen city. Section 4.5 is an overview of the apps used during the field trial.

- *Chapter 5 Field trial:* Details the first field trial. Section 5.1 explains the day of the field trial. In section 5.2, I am waiting at the light rail stop. Section 5.3 is how

it was on the light rail. In Section 5.4, I was on my way to Espresso House and in section 5.5, I meet my friend at Espresso House. Section 5.6 details a visit to Big Bite.

- *Chapter 6 2nd Field trial:* Describes the second field trial. Section 6.1 discuss walking with someone else. Section 6.2 discuss walking alone.

- *Chapter 7 App redesign:* This chapter looks at redesign suggestions for one of the apps used in the chapter 6. Section 7.1 is the introduction to the chapter. Section 7.2 gives an overview of the app. Section 7.3 discuss the website version of the app. Section 7.4 presents suggested app changes.

- *Chapter 8 Discussion:* Chapter 8 discusses the autoethnographic study, what was learned during the field trials and what the limitations was for this thesis. Section 8.1 discusses Autoethnography as a scientific method and my experiences of using it. Section 8.2 is the discussion of the use of smartphone while traveling and the Skyss Resie app. Section 8.3 discusses what I learned from the field trials. Section 8.4 details the research limitations of this thesis.

- *Chapter 9 Conclusion:* Chapter 9 looks at what can be conclude from this thesis and further work. Section 9.1 is my reflections on the study. Section 9.2 discuss future work.

Chapter 2

Background

In this chapter, background about necessary terms is presented, as well as previous work related to this thesis and information about the participant in the autoethnography study.

2.1 Disability

There are many different definitions of what it would mean to be disabled. Furthermore, according to the World Health Organization (WHO), one billion of the worldt's population live with some form of disability, and the number is increasing [35].

> "The International Classification of Functioning, Disability and Health defines disability as an umbrella term for impairments, activity limitations and participation restrictions. Disability is the interaction between individuals with a health condition (e.g. cerebral palsy, Down syndrome and depression) and personal and environmental factors (e.g. negative attitudes, inaccessible transportation and public buildings, and limited social supports)" [36].

WHO's definition of disability, the term is rather broad. In this thesis, when referring to people with disabilities, it is referring to people with a movement-impairing disability.

Almost everyone will, at one point in their life, experience a form of disability. A disability can happen at any moment and does not need to be permanent [35]. The

disability may also differ throughout the day. Due to how different a disability can be for a person, Kalbag says to be careful to apply one person's experience to everyone with that disability [20].

There is also a discussion on whether to use the term disabled or a person with a disability. The distinction is that there is a person with a disability, and the person is not their disability. This thesis will, therefore, from now on, refer to it as people with a disability.

2.1.1 Disability addressed scientific studies

Barczyszyn et al. [3] and Beale et al. [4]. proposed different solutions to accommodate navigation for wheelchair users better. Barczyszyn et al. were focused on route planning; since most route planning services are traditionally based on streets, Barczyszyn et al. propose a sidewalk-based model to accommodate wheelchair users better. This model considers the inclination, existence and maintenance conditions of curb ramps, crosswalks and sidewalks. Beale et al. focused more on terrain and created accessibility maps based on barriers, rolling resistance and surveys of hand-held GIS. The process for both studies involved identifying the needs of wheelchair users, modelling how to meet their navigation needs and how to create a system.

Smooth Sailing? Autoethnography of Recreational Travel by a Blind Person by Stephans et al. describes how a blind traveller plan and overcomes the challenges that may arise while travelling on a cruise as a blind person. The traveller also had to adjust to the sudden cancellation of the ongoing trip due to the Covid-19 pandemic [30].

Vincenzi et al. take a look at how four different people that have a vision impairment work together with their sighted guides to navigate through common spaces. The study discusses the concept of interdependence and how the different couples work together [34].

2.2 Human-Computer Interaction

This thesis is in the field of *Human-Computer Interaction* (HCI), which is a broad field [18].

> "The field of HCI draws on many different disciplines, including computer

> science, sociology, psychology, communication, human factors engineering, industrial engineering, rehabilitation engineering, and many others" [12].

Since the field of HCI includes a broad range of fields of science, it is rather complex. The book *Research Methods in Human-Computer Interaction* by Feng et al. explains the complexity and fascination of HCI [12].

> "Research in the area of human-computer interaction (HCI) is fascinating and complex. It is fascinating because there are so many interesting questions and so many changes overtime (due to technical advancements). It is complex because we borrow research methods from a number of different fields, modify them, and create our own standards for what is considered acceptable research. It is also complex because our research involves human beings who are, to put it mildly, complex" [12].

2.2.1 User experience

User experience (UX) is an essential part of HCI. UX is a design process where the goal is to ensure the product does the job it is supposed to for the user and creates an experience that matters to the user. To achieve this, the designer has to work with the users in mind. Furthermore, remember why and what they are creating [19].

Phil Turners book *A psychology of user experience* mentions three central attributes in UX. These attributes are involvement, affect and aesthetics. High-grade aesthetics are required if the product is to make an excellent first impression. The first impression is essential when it comes to user experience. A first impression comes after 50-500 milliseconds. Consequently, if the first impression is good, the user will care less about technical difficulties that may occur while using the product [32].

Affect is how the user is affected by the product, and Turner believes this to be one of the most significant attributes [32].

> "Affect refers to a variety of psychological states including emotions, feelings, impressions and moods. Of these, emotions are generally regarded the most relevant to UX as they can be thought of as a result of using a digital product" [32].

With involvement, he means we are using the technology in our day to day life and how familiar we are with the technology we use. Personalisation also leads us to become more familiar with the technology and creates a deeper bond with it [32].

In the book, *Accessibility for everyone*, Kalbag talks about the concept of affordance and how it affects the user [20].

> "Affordances are how objects suggest the interactions that can be performed with them — ideally in a way thatt's recognizable by users. For example, when we turn on a new computer for the first time, we look for a button with the power icon. We expect a button because were accustomed to the on-off function of hardware operated by a physical input. We look for the power icon because its a conventional symbol used in electronics (fig 4l). Over time, these affordances become conventions we can rely on, both as designers and as users. Usability can be compromised when designers abandon conventions because wet've decided to redefine how something is usually done. Very occasionally, this can result in a new innovation that genuinely redefines and reshapes behavior, but it usually just makes a really unique mess" [20].

2.2.2 Accessibility

The book on website accessibility, *Accessibility for everyone*, says that accessibility is a form of inclusion and having sites being accessible will benefit everyone. Depending on the context of where and how a user is using a site, they may experience temporary impairments [20].

Empathy is also brought up in the book; the author says that people gain more empathy as they get older. The empathy gained is due to most people experiencing different impairments correlated to ageing. These impairments are, for example, worse eyesight and lesser fine motor skills [20].

Kalbag recommends including people with disability when user-testing as they most likely have similar goals to those in the user group without disabilities; however, they will also reveal if there are issues with the usability and accessibility of the product. She also says that focusing on accessibility from the get-go is the most efficient and less costly way to go [20].

2.2.3 Universal design

Universal design is a concept of design that tries to include everyone in the design process. The concept was created by the architect Ronald L. Mace. Accessibility design tries to cater to people with disabilities. However, accessibility design often ends up being more of an afterthought. For example, if someone is adding a wheelchair ramp to a building after building it. The universal design approach considers people with disabilities in every step of the process by designing to fit everyone from the get-go. Good universal design should include a solution for people who need some adjustments while not making them an obstacle for those who do not need them [20].

2.3 Assistive technology - Mobile navigation and Geographic Information System

In a study done by Brown et al., they show how iPhone users sometimes deviate from the route on their GPS due to, for example, the user finding a shortcut or trying to figure out what direction the arrow on the GPS wants them to go. [8].

It can be challenging to study the use of mobile devices [8] [23]. Notably due to its wide range of use and usage in non-routine times [23]. However, trying to constrain the usage of the device could defeat the purpose of studying the use of mobile devices [8]. It is also important to note that just because it is called a mobile does not mean the user uses it primarily on the go. Mobile devices are often also used while the user is in the comfort of their own home [20].

Vincenzi et al. say that when it comes to using the smartphone as assistive technology, it is more complex than just being an aid [34].

> “Thus, assistive technologies should not be approached as a "gap between disabled bodies and environments designed for non-disabled people" [5, p.161], but as an aspect of the ongoing interplay between different actors and the specificities of any one setting” [34].

Geographic Information System (GIS) combines different data types such as satellite photos, cartography and statistical data to create map data (NGC). An example of a GIS is Google Maps which has many different useful functions such as GPS, discovering new restaurants or figuring out the quickest way to use public transportation [11].

2.4 The participant

The participant in the study is a 24-year-old female with cerebral palsy. Cerebral Palsy (CP) is a condition that can occur when there are problems with brain development and causes problems with coordination and movement [22]. It affects people to different degrees. It is common for people with CP to use three to five times more energy than others, because CP can make the muscles tense up or spasm, making them use more energy while concentrating or even resting. [13]. For the participant, the disability affect their fine motor skill to some degree, they get tired faster than the people around them, and it also affects their mobility. They sometimes use a wheelchair to get around, both a manual and electric wheelchair, but they try to walk unaided as much as possible. They also use leg braces on both feet.

Chapter 3

Methodology

3.1 What is autoethnography?

Autoethnography is an unconventional research method that combines ethnography with components from creative writing [17] [21]. Autoethnography is a self-study, qualitative research method where the researcher acts as the participant and reflects on their experience [30] [23]. It is these reflections that become the primary source of knowledge [21]. However, the reflections are not disjointed from the society around them but rather a part of understanding the surroundings as a whole [30].

In the book "Hva er autoetnografi?" (What is autoethnography), they deconstruct the word autoethnography like this:

> "*Auto* implies to base in oneself and the persons own experiences. *Ethno* implies to put oneself and the experience-based knowledge in context with cultural, social, and political context. *Graphy* points to the multitude of expressions available to convey the exploration, for example text, images, movies, song, stand-up or poetry. " [21] (Here translated to English).

There was a need for different approaches to qualitative research, and autoethnography was developed as one of the methods to fill that need [21]. In the context of technology, it reveals more than a usability or functionality test will do [30].

3.2 The positive sides of using autoethnography

There are many positive aspects of using autoethnography as a research method. One of the central purposes of HCI is to understand the user and how they feel [23]. By using autoethnography, the biggest hurdles to achieving the level of understanding that the researcher wants are gone; due to people having a deeper understanding of themselves than they have of other people [21].

The researcher can then take their experience, turn it into knowledge, make educated decisions, and better express their views and opinions going forward [17].

The research topic could also hit quite close to home for the participant, and the journey of reflecting on the experience could be very personal. It might feel intrusive to have another person conducting and questioning one's feelings while one is still processing the findings [21].

Autoethnography is also a great way of giving a voice to groups and people that might be seen as a minority and often do not get the chance to let their voices be heard [21]. Adding more reports from one person's point of view will help broaden the descriptions out there [17]. The informal tone of autoethnography can also make academia and research less intimidating and make research and its results available for a larger group of people [21].

Researchers also find autoethnography especially useful when researching people with a disability. In the article "Smooth Sailing? Autoethnography of Recreational Travel by a Blind Person", which follows Kate and how she prepares for and manage a cruise as a blind person, they write:

> "Such studies focus around the experiences of a single individual and provide a richer, more personal perspective. They seem particularly well-suited to studies involving disability because of the huge variety of abilities and personal experiences in the disability community and the power of individual narratives to dramatically illustrate inequity" [30].

Furthermore, they go on to talk about how it changes the perspective of who the participant is and makes them human first and foremost. Instead of focusing on finding a participant with a disability and then looking at the human aspect, the research takes

the human side into account first. The research then looks at how that human feels and does things with a disability [30].

3.3 The critics of autoethnography

A downside of using autoethnography is that, in practice, autoethnography can be disruptive and distracting for the researcher. It can also be challenging to capture the whole experience by themselves [23].

Critics of autoethnography say that autoethnography is narcissistic, too individualised and too introspective to be called a research method. Some critics go so far as to say that the main point of using autoethnography is the therapeutic effect it has on the researcher. Others say that autoethnography is based on too little theory and based too much on emotions [21].

3.4 Autoethnography used in scientific studies

Hynes did an autoethnographic study about walkability in his local community. In his study, he walked to work while recording his thought, experiences and emotions. From this study, he criticises the local council for their development of the local environment for not being walking-friendly [17].

Gamboa involved her family in a year-long autoethnographic study on how robots and drones affected her children in a domestic environment [15].

Another autoethnographic study was done by Stephans et al. over the course of two years, exploring how it is for a blind person to go on a cruise. The study includes the planning phase as well as a travel diary. The cruise was supposed to last for twenty-eight days subsequent. However, due to the unforeseen cancellation of the cruise nine days in because of the start of the pandemic in 2020, the study also take a deeper look into how the person deals with unplanned events [30].

O'Kane et al.'s autoethnographic study about using a wrist blood monitor during non-routine situations focuses on how autoethnography works as a research method. As well as how autoethnography is a tool to gain empathy and how empathy helps and is important for designers [23].

In the book “Hva er autoetnografi?” (What is autoethnography?), the five authors share their own autoethnographic essays as well as one they created together about autoethnography and working together. The essays cover a vast amount of topics and research fields, and their goal is to show how autoethnography can be used in a variety of fields and be diversely written [21].

3.5 Why I decided on autoethnography

Since autoethnography is about the researcher self-reflecting on their own experiences, I thought it would be fitting to share why I chose it and how I feel about autoethnography.

The primary reason for doing an autoethnographic study is that I do not feel represented in the research that is out there about people with a disability. I could not find studies that reflected how I experience being out and about, and not many studies about people with a disability use autoethnography as a method [30]. I do use a wheelchair at times, but I prefer if I can manage without my wheelchair. However, there is also the fear that my point of view may not be "right" to someone else and that how I experience things might not matter to anyone, but myself [21].

However, these feelings are normal to have to work through while doing an autoethnographic study. Stephens explains well why autoethnographic studies are particularly well suited for the domain of disability.

> “They seem particularly well-suited to studies involving disability because of the huge variety of abilities and personal experiences in the disability community and the power of individual narratives to dramatically illustrate inequity” [30].

There is also the possibility that the way I see and feel my experiences will change as I reflect on my experiences and share them with others [21]. I have never sat down and thought thoroughly about exactly why I do what I do and if they differ from how people without a disability would have done something. Working this out will benefit not only the world of academia but also myself, both on a personal and professional level.

Chapter 4

Methods and tools

This chapter explains field trial as a research method and explains the the process behind the field trials. The chapter also includes some local knowledge that might be useful to know going forward in the thesis, as well as an overview of the apps used during the field trials.

4.1 Field trial

Field trial as a research method, also known as field experiment, is conducted in a natural but uncontrolled environment. One of the advantages of a field trial is that it reflects a real-world setting. However, since it is uncontrolled, the researcher does not have control over what the participant experience and it can be hard to know how much the environment influences the experience [37] [24]. Since this is an autoethnographic study, I, as both the researcher and participant, have a greater opportunity to reflect and notice how the fact that it is a field trial impacts the study.

4.2 The process

The field trials were completed on the 21st of February 2022 and the 19th of September 2022. The researcher used AirPods, and the Voice Memos app [2] on an iPhone 11 to narrate for themselves while walking around. The AirPods were used so the researchers could make notes for later without using their hands. The recordings made on the Voice Memos app were later transcribed into Microsoft Word.

Figure 4.1: Picture of the Bergen light rail from [14]

4.3 The Bergen light rail

The first part of the *Bergen light rail* (Figure 4.1), also called "Bybanen", was finished in 2010. The light rail goes from Byparken in the centre of Bergen to Bergen airport, Flesland. Today the light rail consists of 27 stops. However, construction is underway to make the light rail reach a more extensive part of Bergen [9].

4.4 Bergen Storsenter

Bergen Storsenter (Figure 4.2) is a shopping mall in the heart of Bergen. The shopping centre was built in 1988 [5], and today it has several stores, hairdressers, cafes and more [6]. Originally the shopping centre was built due to the need for modernisation of the Bergen bus station, and it was named Bystasjonen. In 1997 it was bought by Thon Eiendom, and in 1999 it changed its name to Bergen Storsenter [5].

4.5 Apps used

Here is an overview of the different apps used during the field trials.

Voice Memos is an app developed by Apple to turn the iPhone into an audio recording

Figure 4.2: Picture of Bergen Storsenter from [31]

device. The app also has possibilities for basic editing of the audio files [2].

Maps, or *Apple Maps*, is an app developed by Apple for navigation and exploration. With this app, one can navigate through a city with the help of GPS and discover new places, such as restaurants. The app can also assist with using public transportation and has real-time traffic updates, which can help the user when using public transport and when they are driving themselves [1].

Google Maps is an app developed by Google LLC for navigation and exploration [16]. Google maps are similar to Apple Maps but differ in some aspects, such as interface design and the quality of navigation, suggestion, and real-time traffic data [25].

Skyss Billett is an app developed by WTW AS for Skyss [38]. Skyss is Bergen's leading public transport provider for such as bus and light rail. Skyss Billett is their ticket app where one can purchase either single-use tickets or period tickets [29].

Skyss Reise is an app developed by Skyss for assistance when using public transport. The app has a route planner that shows the different options the user has to pick from in real-time [26].

Studentbevis (Student ID) is an app developed by Unit - Directorate for ICT and joint services in higher education and research [33]. This app is a digital alternative to

the physical student id. With a student ID, one can get benefits such as discounts on public transport tickets as long as the student is younger than 30 years old [28].

Espresso House is an app developed by Espresso House AB for personalization and online ordering. This app allows users to view the menu, order, and get personalized offers and discounts. It is also possible to add money to the app and pay with the app in the store, which gives the user a 10% discount on their purchase [10].

Chapter 5

Field trial

5.1 On the day of the field trial

I was meeting a friend for a coffee in town, and depending on how long the coffee date would last, I might also grab some lunch while in town. The plan was to meet up at Espresso House. I have the Espresso House app [10], and I knew I had a coupon that gave me fifty per cent off if I ordered through the app (Figure 5.1). I went on the app to check where it was possible to order through it (Figure 5.2), and I texted my friend that we could meet up at Espresso House Bergen Storsenter, which was a convenient place for both of us to meet. While I was on my smartphone, I also filled up the money I had in the app since one gets a ten per cent discount if one uses the app to pay (Figure A.1).

I open Google Maps [16] and put Espresso House in the search bar (Figure 5.3 and Figure 5.4). Figure A.3 depicts how the search process would have looked if I had used the map app provided by apple. My ticket for the Bergen light rail had expired the night before, so I bought a new 30-day ticket [38] (Figure A.2). I always make sure that I have a valid ticket before I leave so I do not have to buy it when I am on the light rail, so that when I am at the light rail or the light rail stop, I can spend all my energy and focus on navigation and getting to the destination in one piece. I always try to ensure that I am prepared and have everything I can control under control before I leave my apartment.

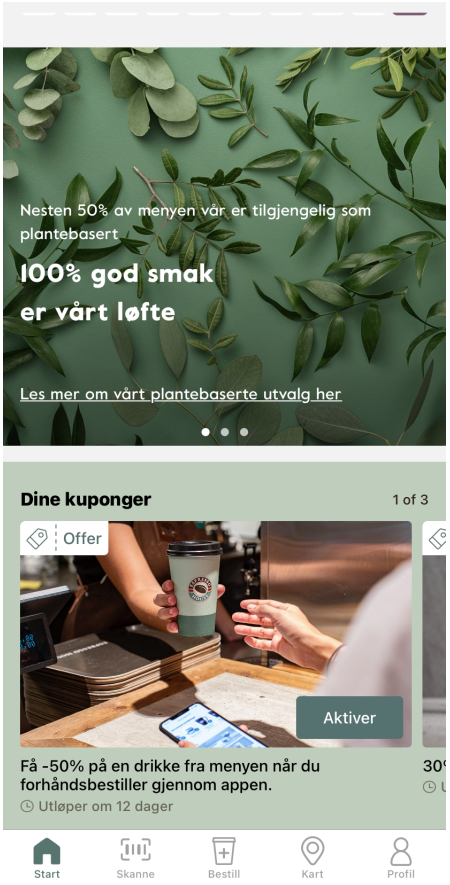

Figure 5.1: The homepage of the Espresso House app shows the user the coupons they can use

5.2 At the light rail stop

While I was walking toward the light rail stop, there was a bit of ice right before the platform. I nearly slipped. However, I somehow managed to keep my balance. There were many people already waiting at the platform. Although I am confident that some of them must have noticed my almost fall, I found myself grateful for not falling on my face in front of all these people. The gratitude quickly turned into a feeling of contradiction. Because I would assume it would be better, or at least safer, to fall in front of other people that way, there would be someone else there that could give a helping hand. Despite this, I know I would prefer to lose my balance and fall when no one else is around. I also know it is wrong and that it is that mentality that drives my mother and my boyfriend equally crazy and concerned. I guess that is a subject one could dive deeper into another time.

When I arrived at the platform, I looked at the sign to see when the next tram would arrive. However, when I looked up, the sign was broken, and a couple of workers were there to fix it. The sign was unreadable. However, I looked at my smartphone, and

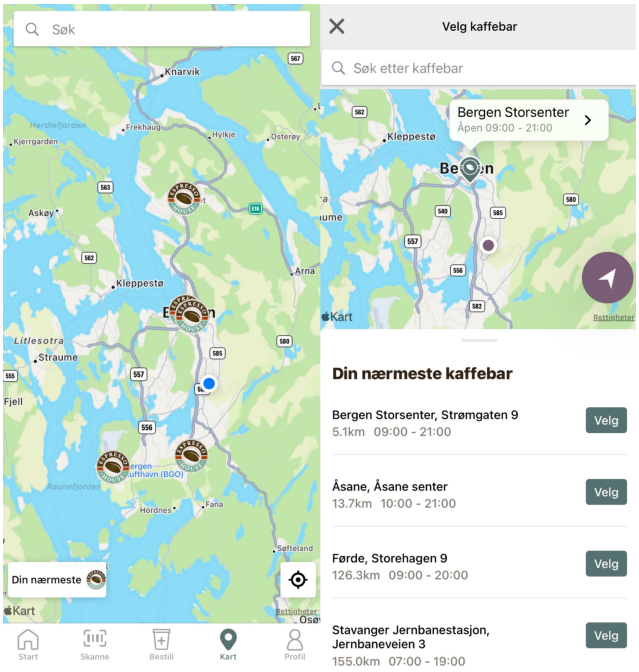

Figure 5.2: In the Espresso House app there is a map where on can pick which store to order from

Google Maps [16] told me that the next tram would arrive in three minutes.

Generally, I try to place myself on the platform to be closer to the entrance I would like to enter. Usually, I try to stand more in the middle of the platform. However, there were so many people waiting on the platform that I figured I would probably get quite behind in the queue and would most likely not get a seat. I, therefore, decided to stand and wait closer to where the front of the tram would stop.

5.3 On the light rail

As soon as I step onboard the tram, an inner clock starts to tick. I know I only have a short amount of time before the driver begins to drive, and I need to find a seat as quickly as possible. I scan the tram. In my experience, one is more likely to be given a seat by someone if one takes the bus. Quite rarely does anyone on the light rail stand up and give away their seat. Unfortunately, it is pretty full, and there are no comfortable places to stand. Well, I say comfortable places to stand. To be honest, there is only one place on the light rail I feel comfortable standing, by the doors on the opposite side of the entrance. However, I cannot stand there for an extended period of time.

I am not too fond of every seat on the tram either. I usually prefer sitting on one of the two-seaters close to one of the entrances. The sitting group with four seats has

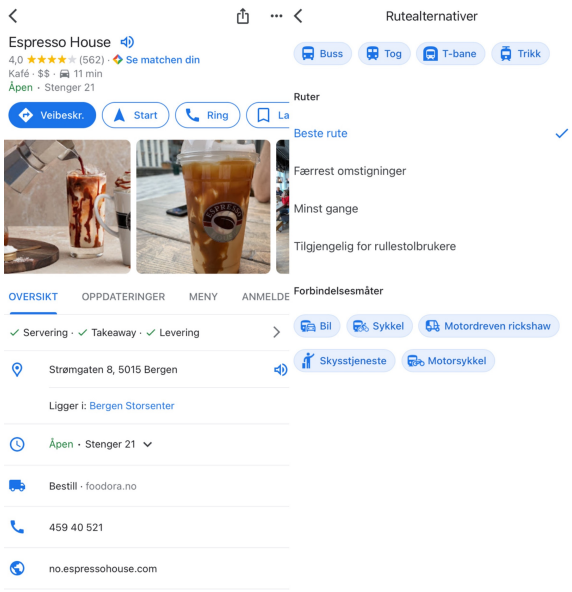

Figure 5.3: Part one of using Google map to navigate to Espresso House

a small ramp next to it that I dont always feel comfortable walking up (Figure 5.5). However, if you sit on one of the seats closest to the aisle, you can angle your body sideways with your feet almost in the aisle. That way, you dont have to have one foot on the top of the ramp and the other halfway down the ramp, and my favourite part about it is you dont have to get up if the person next to you is getting off.

There is one available seat on one of the four-seaters closest to the aisle. It is not ideal; however, I would rather sit there than stand in the middle of the aisle the entire journey. There are not many people in front of me, so I manage to squeeze by the people standing in the aisle and get to the seat before anybody else. I sit down and look up to assess the situation for when I must get off the light rail.

Despite sitting on the opposite side of the aisle, the couple in front of me was determined to hold hands the entire journey. Therefore their bodies were angled towards each other the whole trip and, as a result, blocked the way for everyone wanting to go on or off. The lady in front of them had a pair of skis with her that were poking out into the aisle. This meant that when someone had completed the level of the clingy couple, one had to overcome the stumbling block from the ski lady.

When I can, I try to use public transport when it is less busy. My driving instructor used to tell me that the best way to avoid a lot of traffic was to drive when most people were not driving. Avoiding rush hour and the holidays and so on. However, even though

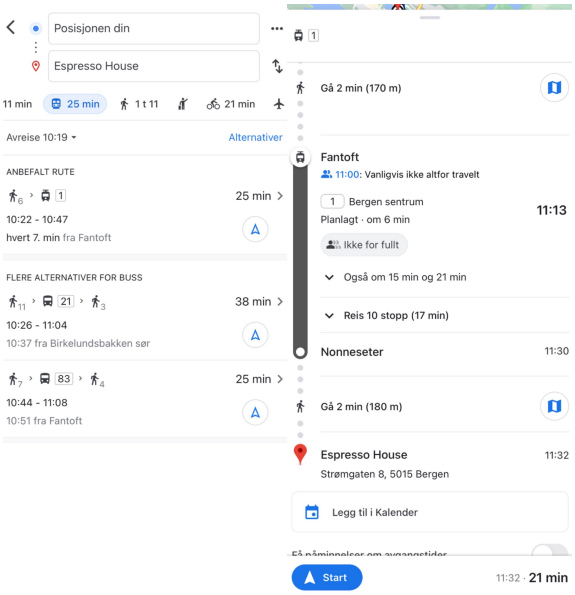

Figure 5.4: Part two of using Google map to navigate to Espresso House

it is a good idea, in theory, it only sometimes works in real life. It is only occasionally possible to avoid rush hour, and some days it can seem like every hour is rush hour. Everywhere feels very busy at the moment and especially after everything has started to open up again after the pandemic.

5.4 Going to Espresso House

I prefer to take the light rail over a bus because there is almost no gap between the tram and the platform. However, when it is raining or cold outside, the tile right by the trams exit gets slippery (Figure 5.6). These tiles are also on both sides of the railway crossing. The railway crossing is also a bit of a challenge. Due to the railway tracks, the ground is quite uneven, and the railway tracks are just lying there waiting for someone to trip.

Espresso House has two main entrances (Figure 5.7). One can walk through the main entrance to the shopping mall or use the door that leads straight into the coffee shop. I was unsure how heavy the door to the coffee shop was, and in fear that it might be too heavy, I was not that keen on finding it out. I, therefore, decided to take the longer route and walk to the main entrance.

5.5 At Espresso House

When I arrived at Espresso House, the coffee shop was quite crowded. I checked my smartphone to see if my friend had texted me that they had arrived. They had not sent

Figure 5.5: The ramp on the tram that sometimes can be a challenge

Figure 5.6: This tile often gets slippery when it is wet

anything. I, therefore, started to look for a table. I prefer to know where I am sitting before placing my order, as I do not like having to find a table and carry my order simultaneously. I locate a table, and as I take up my smartphone to let my friend know, my friend walks in.

As I mentioned previously, I had a coupon that gave me a fifty per cent discount if I ordered through the app [10]. However, when I was ready to order, there was no longer the option to order through the app (Figure 5.8). I asked one of the people working there why the app was no longer an option. The person told me that it was up to those that were at work if they wanted to get orders in through the app or not and that they had turned off the option for the moment due to a rush of people coming in. There

Figure 5.7: The two different entrances into the coffee shop

was only one espresso house in the whole of Bergen that allowed the customer to use the app to place their order. Figure A.4 shows how the ordering process is supposed to work.

I have leg braces on my feet which makes me unable to bend my ankle while wearing them. It does not affect my walking much, except walking downhill is more exhausting for me than for other people. However, standing straight up and down for an extended period of time can be tiresome. Since the Espresso House was quite full, there was also a long queue. A long queue to order usually means a long wait for the order to be completed. Which meant that I spent a lot of time standing straight up and down, waiting to order, and waiting for my order to be done.

While I was standing in the big unorganized pile of impatient coffee addicts, who seemed to believe that their coffee would be made quicker if they stood as close to the counter as possible, my friend came up next to me with a panicking look on their face. My friend had also planned on using the app and panicked when placing their order, forgot the name of the drink they wanted, and ended up just saying the first thing they had read on the menu.

While we were at the coffee shop, they received their supply delivery, which was

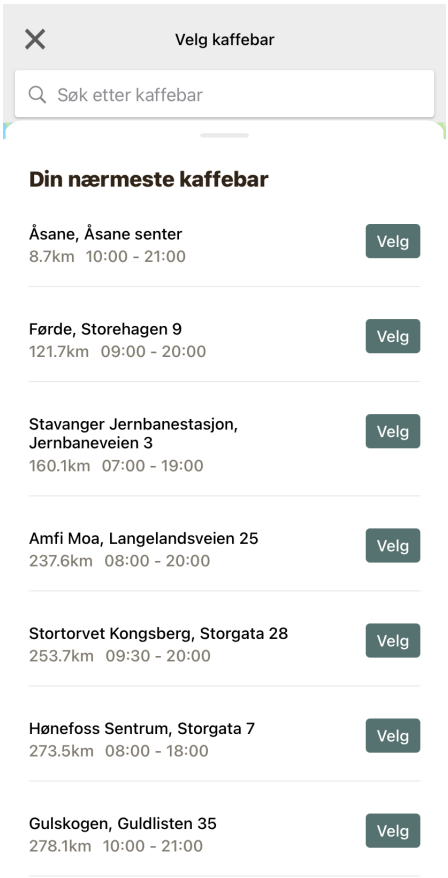

Figure 5.8: Bergen Storsenter was no longer an option in the app

delivered right next to the table we were sitting at. The delivery blocked most of the floor space between our table and the place the customers pick up their orders (Figure 5.9). Thankfully we had already picked up our order. Otherwise, the large pallets with order delivery would have been quite an obstacle to overcome.

5.6 Big Bite

When we were done having coffee, I realized the time had gone by quicker than anticipated, and I only had a little time before I needed to head back home. I decided to grab a quick lunch to go. I like to believe that if I am going to eat fast food, Subway or Big Bite are healthier options. There are not many Subway places in Bergen, so I took up my smartphone and typed Big Bite into the map app provided by Apple [1] (Figure 5.10).

The results showed that there was one at the mall I was already in. I must admit I am not that familiar with the different choices that Big Bite provides, and I really cannot stand having to decide on what I would like to have if I am unaware of my options. I

Figure 5.9: The delivery that arrived while we were sitting there

knew that some Big Bite locations had installed large ordering screens. However, I was unsure if the Big Bite at Bergen Storsenter had screens one could use to place an order. They do have a Big Bite app [7]. However, there are no options to order through the app. I figured I could walk over and see what it looked like, and if I had to place my order orally, it would not be the end of the world.

At first, I did not think the Big Bite at Bergen Storsenter had screens I could order at. The screens I have seen previously have been quite large and easy to spot. There were a lot of people standing in line to order at the cash register. So, I just assumed that that was the only spot to order. However, heading towards the line, I noticed some smaller screens next to the cash register. I figured it would not hurt to take a closer look, and lo and behold; I could use those screens to place my order (Figure 5.11). My social anxiety heart felt very blessed at that moment. After looking through the different options on the screen, I placed my order and went to wait for my order.

My order was done before some of the people already there had a chance to place theirs. I must have looked very smug at that moment. I took my lunch, walked back to the light rail stop, and went home.

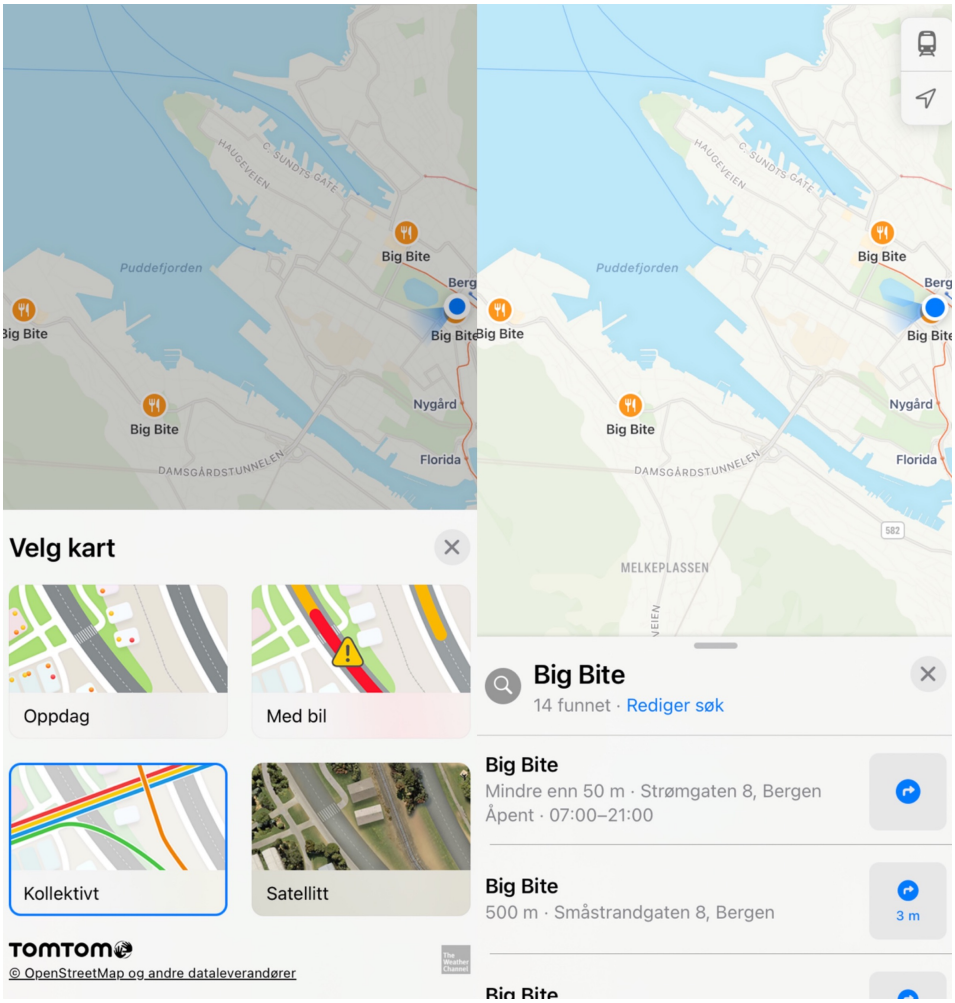

Figure 5.10: Using the Map app provided by Apple to navigate to Big Bite

Figure 5.11: The machines one can use to place an order at Big Bited

Chapter 6

2nd Field trial

For the second field trial, I was going home to visit my family. There are three different ways I usually travel either by car and a ferry, a bus and a ferry, and the third option is by an express boat. I have travelled by bus and ferry once. However, I forgot that it was the start of the Easter holiday, and the bus was so crammed and noisy that I never used it again. Travelling by car and ferry is quite a rare occasion. It feels pretty luxurious to bring a lot of baggage, and there are many more departures with the ferry than the express boat. However, the car and the ferry take over an hour longer than the express boat option, and having access to a vehicle is only sometimes possible.

6.1 Walking with someone

The day I was travelling back home, I had a friend over for a study session. My friend was planning on meeting someone for dinner later, and I saw an opportunity to ask if we should head into town together when we were done studying. I only ask others to come with me if I am almost entirely sure they will say yes. I will often try to make it as convenient as possible for the other person, and if I can fit it into their schedule, I will.

The boat leaves at 20.10. However, I like to be there early, so I set my desired arrival to 20.00. When I first moved to Bergen, I would always plan to be there way in advance. However, I quickly realised that they would only let you board a little ahead of the departure time. So rather than stay on the dock for a long time waiting to board, I now try to plan my arrival time not to be too far away from the departure time but give me enough time to pick a good seat and get all my stuff put away and settled before the

boat is in motion.

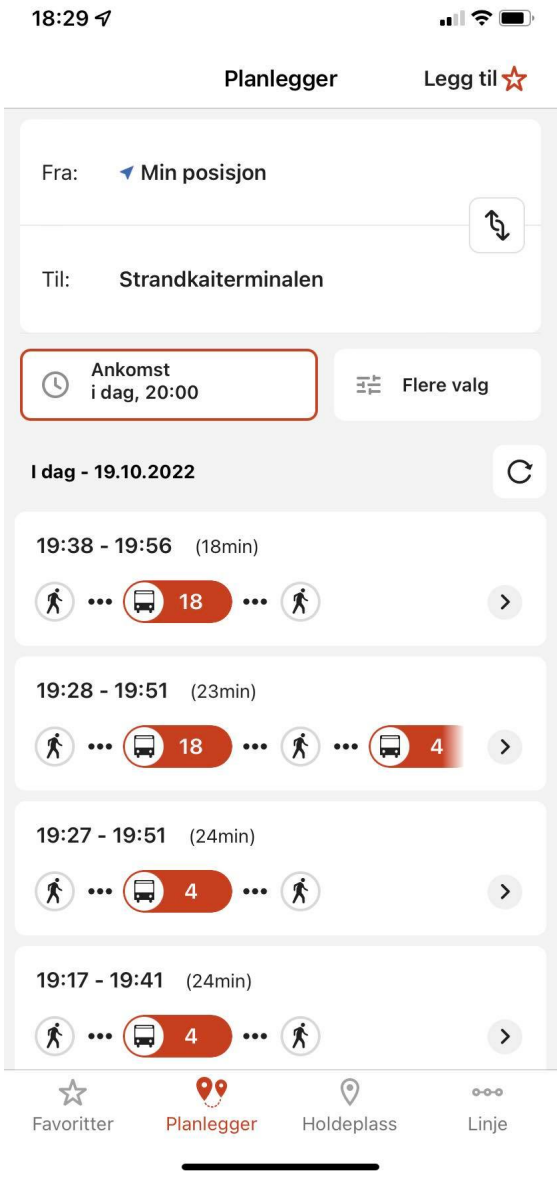

Figure 6.1: The Skyss route planner app

We used the Skyss route planner app [26] to see what options we had when it came to which bus we could take (Figure 6.1). In the next chapter, a further look into how the app works and what changes I would personally make to the app.

When we got on the bus, I ensured I got in the seat before my friend did. That is not only so I can guarantee that I am sat down before the bus starts to move but also so I do not have to get up first when we get off the bus.

We went off the bus a few stops early because my friend wanted to look at a particular top in one of the stores. If I were on my own, I would not have stopped to go into

Figure 6.2: Too steep ramp which is in the way of the bad hand rail

that store. I have not been there by myself before. The reason for this is the stairs and the ramp into the store (Figure 6.2). The ramp is not functional to use if you do not have a wheelchair, and even then, I am not sure if it is usable. I can imagine someone with a child in a buggy would be able to push the pram up the stairs. However, it does not seem likely to be an easy job.

It is essential to mention that the building has a functioning ramp on the other side of the building (Figure 6.3). However, it is rather far to walk, and I must admit it did take me some time after moving to Bergen to realise that there was another entrance. I, therefore, commonly choose not to go into the building altogether as I do not think any of the available options are worth the hassle.

It is difficult to explain the difference between walking with someone instead of

Figure 6.3: Functional ramp on the other side of the building

alone. Walking with somebody else is so much easier, though. It is not like I need the person to do anything in particular. Just knowing that there is somebody else there makes me relax so much more, and I, therefore, walk more confidently and feel more secure in my movements.

As we were saying our goodbyes, I saw writing in the store window that said the place was accessible for wheelchair users (Figure 6.4). I was pleasantly surprised by the writing as I am not accustomed to seeing establishments clearly state that their place is accessible. Generally, if one has not already checked their website or called ahead, accessibility, or lack thereof, is something one has to deal with when one gets there.

I did not have time to go in and eat some sushi, though, and I do not think the other passengers would like it if I brought fresh fish with me on the boat. Just because

Figure 6.4: Sign in the store window showing that it is accessible for wheelchair users

someone travels by boat does not mean they want the whole fisherman experience.

6.2 The dock

One thing I do not do when walking alone is to look far ahead at where I am walking. I look straight before me to see if there are any immediate obstacles I need to be aware of while walking. Herefore, I rely on knowing the route well beforehand, and it takes a lot of extra time and energy whenever something on my way is different from how I remembered it.

Because of construction work, the sidewalk I usually walk on was much narrower than it typically is (Figure 6.5). At first, I did not want to try to walk that narrow path with so many people walking towards me, so I decided to cross the road. Since I

Figure 6.5: Constriction work making the path quite narrow

looked right in front of me while walking, I did not see the construction sign that said the sidewalk was closed (Figure 6.6) until I almost faced the obstacle. I could have crossed the road by the construction sign. However, there is no crossing there, and I do not feel confident enough in my walking speed to cross the road where there is no crossing.

I always google when there is high and low tide before deciding which departure time I will take. It is much easier to go onto the boat ramp when the water is high up because there will be less gap between the pier and the ramp. As a result, I have previously changed the date I am coming home because there were no departures where I felt comfortable enough with the sea level to take the boat by myself. The sea level does not matter on the dock at home because the ramp will, no matter the time of day, be on top of the pier. It does annoy me a lot that the ramp in Bergen lies next to the

Figure 6.6: The sidewalk is blocked by construction

dock. Instead of on the pier as it does back home. I do not particularly appreciate arriving in Bergen when the sea level is low, as there is quite a big step up to the dock, and the rail is not long enough to assist. However, I feel very comfortable and proud of how I have adapted to the situation.

My favourite feature of the Skyss ticket app [38] is that one can buy a ticket to the boat on the app (Figure 6.8). Buying the boat ticket on the smartphone did not use to be possible. One used to have to wait until the crew were done with departure, then walk over to the area in the middle of the boat where one could buy food and refreshments and either show them the valid ticket one already had bought or buy a new one there, and then go back to one's seat. All this while the boat is in motion. That used to be the most significant dilemma when travelling by boat, do I sit close to where one can buy the ticket, or do I sit close to the exit so I would be sure to have enough time to get off the boat before it went to the next stop. During the pandemic, they updated the app so one can buy boat tickets there as well, so now, one can stay in the seat and show them the valid ticket if they come around and check. I assume the primary purpose was to reduce human interaction and how close people were standing next to each other during a global pandemic. However, the new function in the app did ease travelling by boat

Figure 6.7: Depending on the sea level, the boarding ramp can be lower on the other ramp making it quite steep

for someone with mobility difficulties.

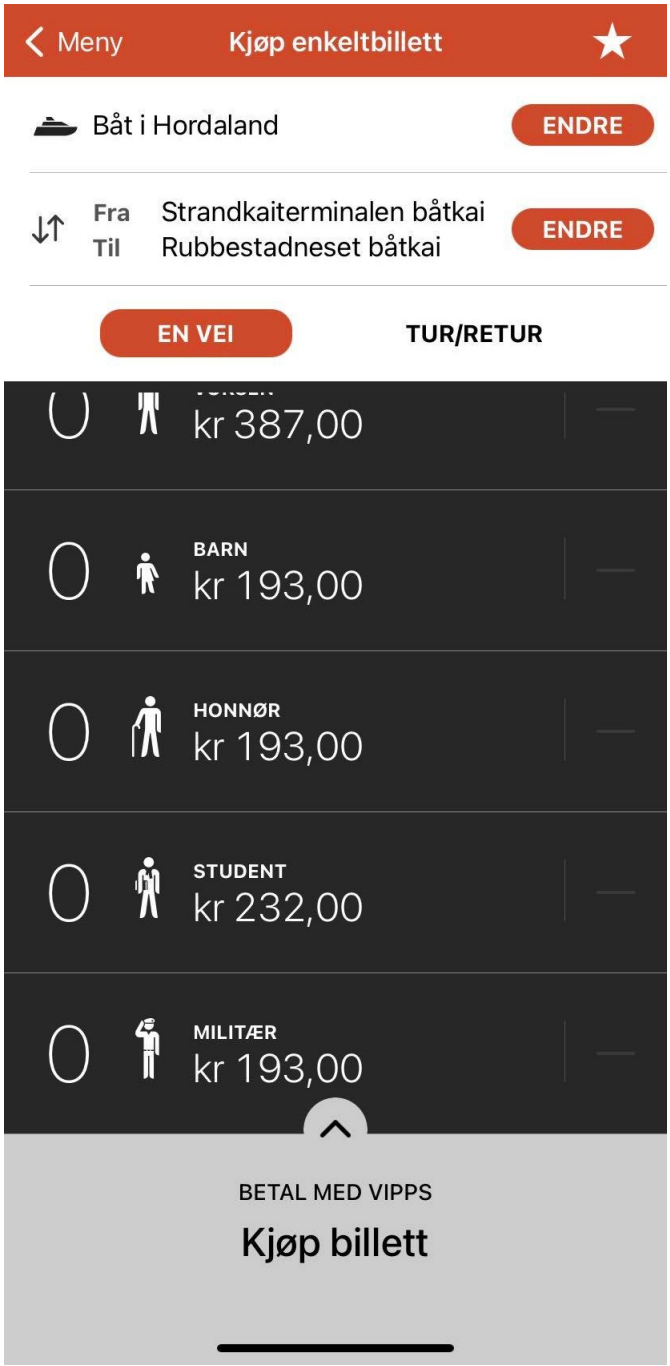

Figure 6.8: Buying a boat ticket through the Skyss app

Chapter 7

App redesign

7.1 Introduction

This chapter takes a deeper look into how the travel planner app (Skyss Reise) from Skyss [26] works and what changes and improvements I personally would have made if I was in charge of designing the app. This thesis will only look at the app's feature to plan a route according to the desired starting and ending points.

7.2 App overview

Before getting into the changes I would have made, here is an overview of the app in its current state.

The user can put where they are going from and where they are going to at the top of the page (Figure 7.1). Then they can either have the search result show the possible routes at the time of the search or set the desired arrival or departure time. There is a "More Options" button, and the date and search results are further down on the page. One can also scroll further down to see and load more departures (Figure 7.2).

If one presses the "More Options" button, one can adjust the type of transportation one would like to see in their results (Figure 7.3). The options are bus, airport shuttle, boat, the bybane, train, express bus and the last option is other. One can also adjust how many minutes one would like to have at minimum between layovers. The user can also pick how fast they walk, choosing between slow, normal or quick. There is also a reset and an update button at the bottom of the page.

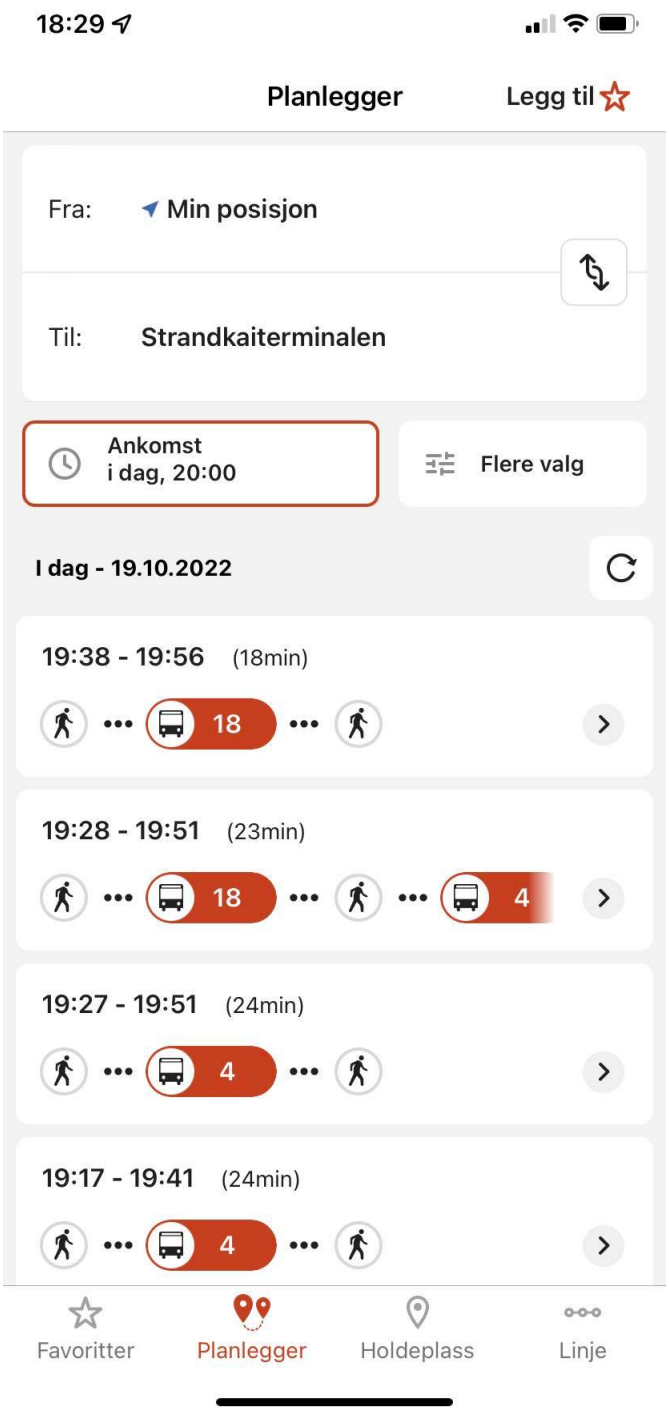

Figure 7.1: The search page

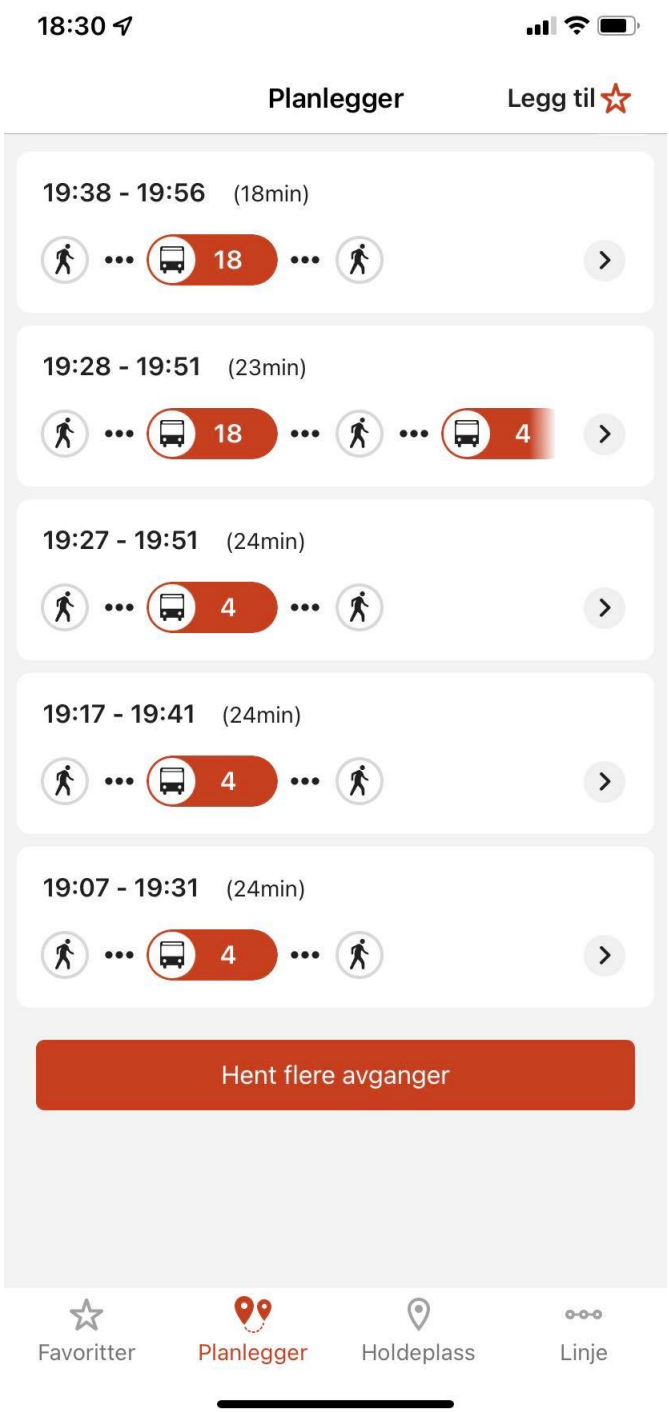

Figure 7.2: Search results

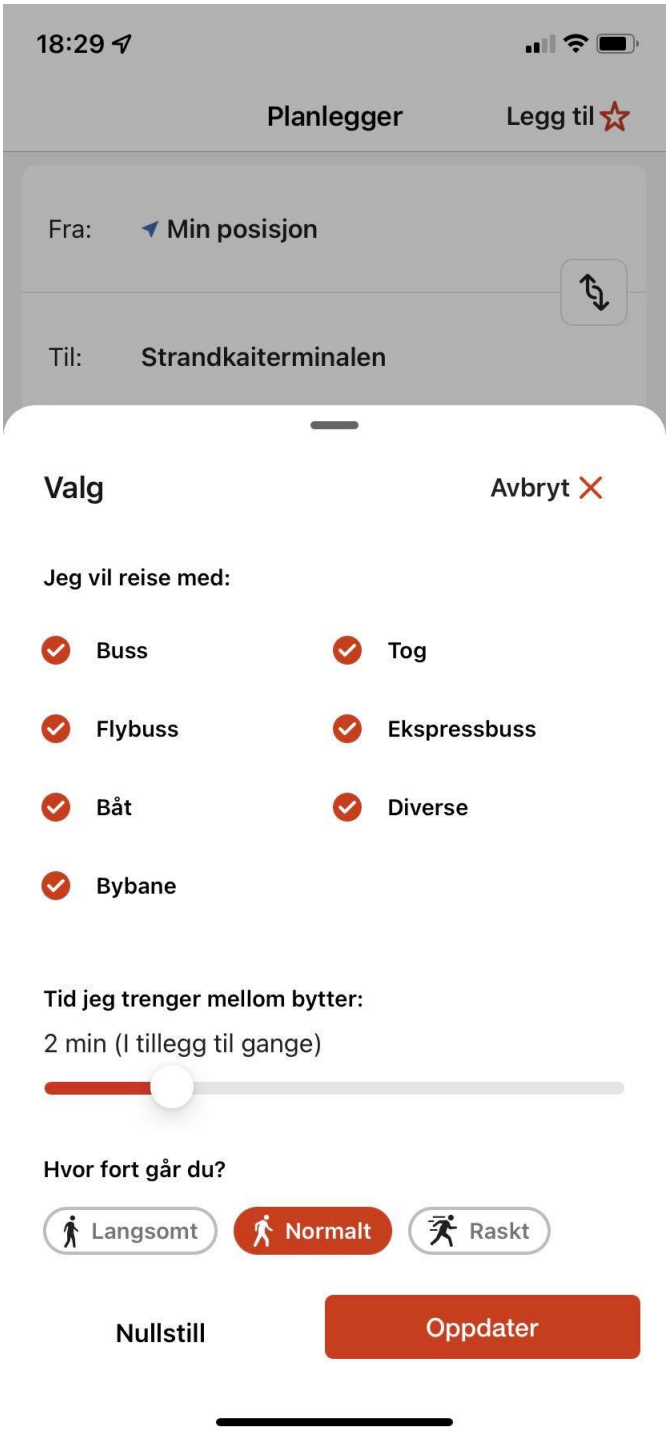

Figure 7.3: Search settings

7.3 Website version

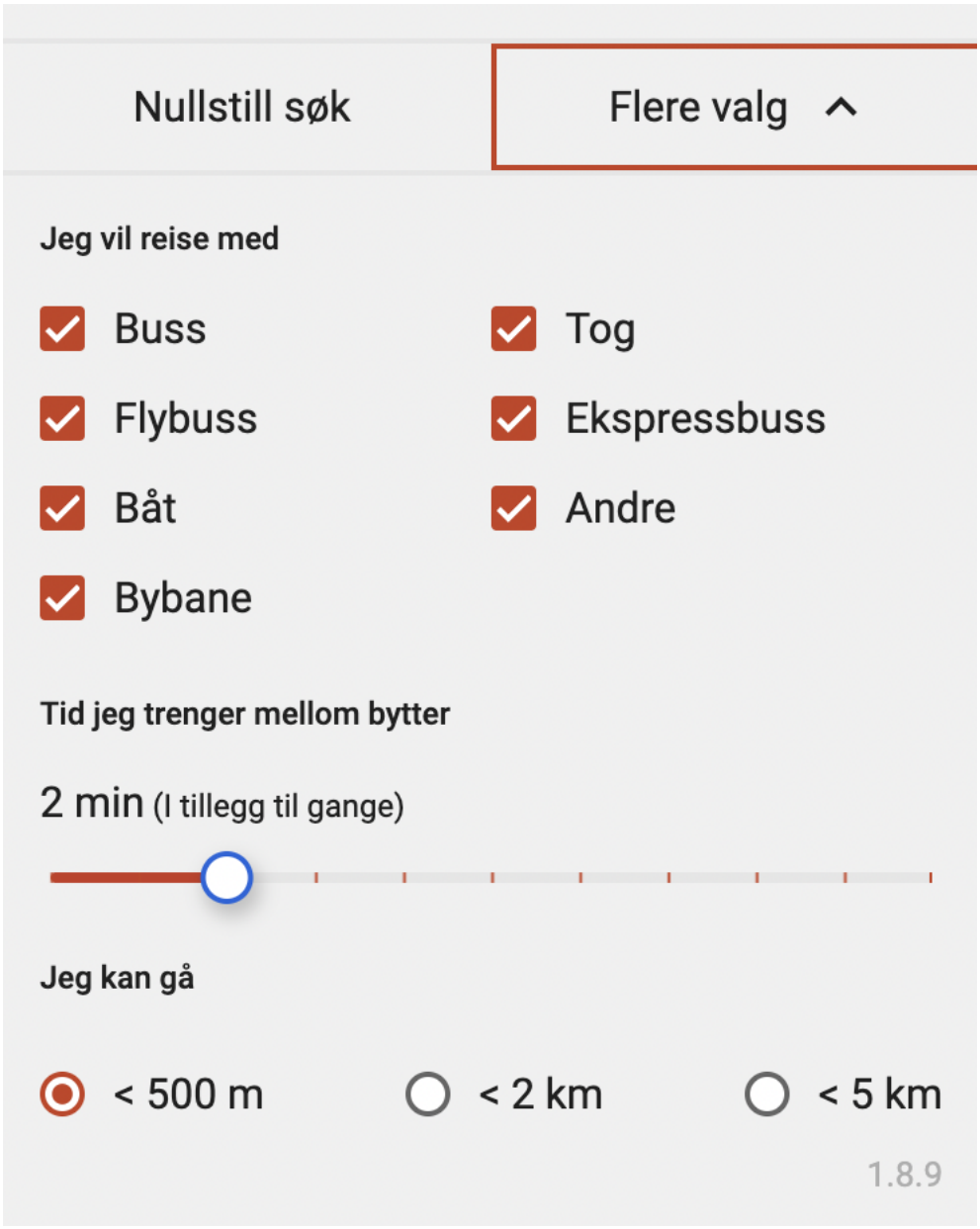

Figure 7.4: Search settings on the website

The website version [27] of the travel planner has a different type of search setting than the app version [26]. Instead of the user giving their walking speed (Figure 7.3), they put in how far of a distance they can walk (Figure 7.4). The options are less than 500 meters, less than two kilometres and less than five kilometres. However, when I tried to change the settings (last tried on the 19th of October), it did not affect my search results in any way. It may be that there were no available routes with those settings. However, the website did not give me any information about it, so there is no way of knowing for

certain if that was the problem.

7.4 App changes

When on the search page, the app has a "Flere Valg" button, which can be translated to "More Options" or "More Choices" (Figure 7.1). At first, I thought the button would show more options I could choose from when it came to bus routes. However, the button led to a menu with different settings for the search. I, therefore, decided to change the name on the button to "Innstillinger", which is "Settings" in English (Figure 7.5).

The app has a feature that sometimes shows if a bus is full. The problem I had while using the app was that the information would only be available right before departure, and the data was not always available. For planning purposes, I added a feature that will show if the line is normally busy at that time (Figure 7.6). The data would then be based on statistics rather than real-time, and I think it would be best if the information were combined. However, I would rather have the function I added where one gets information all the time than data that is sometimes available.

I added an orange border around the reset button to make the button more visible (Figure 7.7). In section 2.2.1, Kalbag [20] talks about the importance of making objects recognizable to the users in the concept of affordance. I added the border because it took a while before my brain registered that it was a button. It did not look like it was clickable. I, therefore, did not think to click it.

One thing I kept doing that was driving me crazy while using the app is I would update the settings I wanted, but instead of pressing the update button, I clicked outside of the menu to close it, and it did close the settings menu. However, none of my settings changes was saved. A way to avoid this is to remove the update button and have the settings automatically update (Figure 7.7).

I was going back and forth on whether to have the user set their maximum travel distance, as on the website, or their travelling speed, as on the app. I decided to include both as I managed to make them both fit, and they do serve different purposes (Figure 7.7). However, I would have gone with the user's maximum travel distance if I could only include one.

As I mentioned, they do serve different purposes. How far someone can move without public transport will have a greater impact than how fast they are moving. If one moves slowly, that can be taken into account while planning. However, if someone can not get further than a set amount of meters, then they can not get further than the set amount of meters. No matter the planning.

I tried to make the language more inclusive regarding the speed and distance setting (Figure 7.7). I changed the phrase "How fast can you walk?" into "How fast can you move?" and the phrase "I can walk" into "I can move".

All of these changes only reflect my experience with the app, and they only affect things that I found difficult with the app or things that made it harder for me to use the app. Someone else would perhaps choose to focus on another aspect of the app.

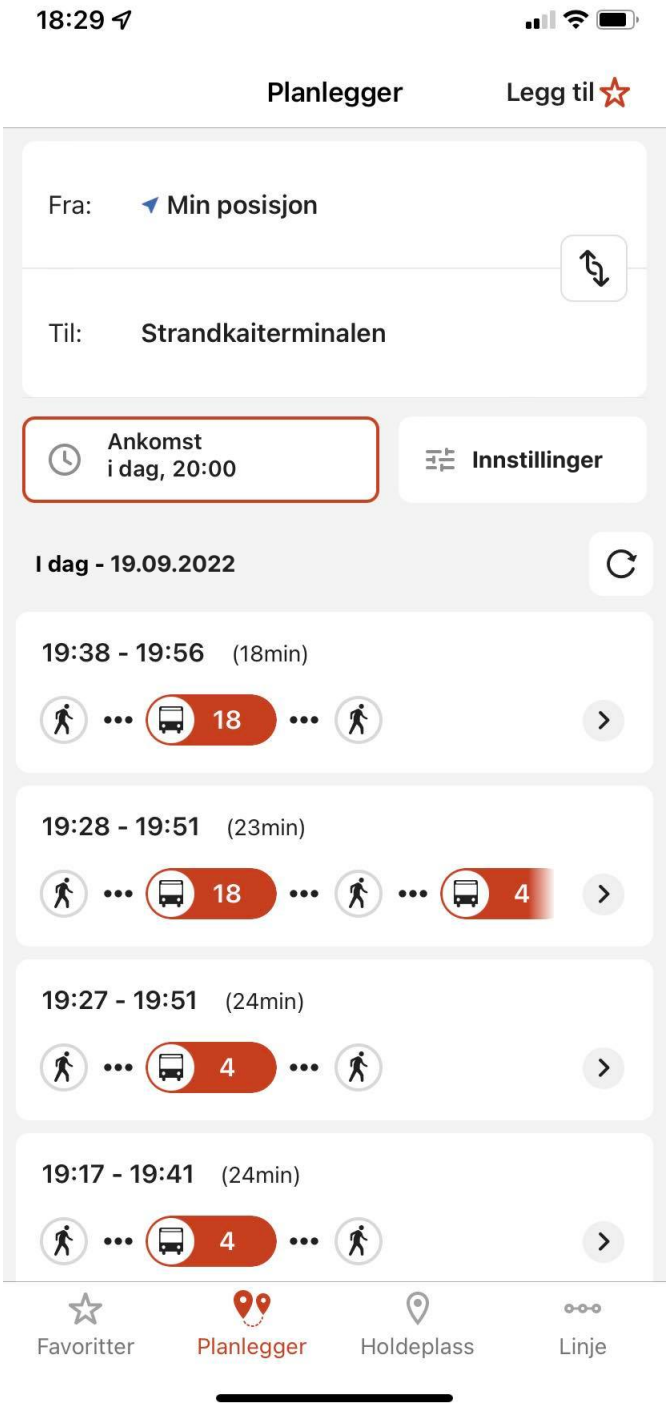

Figure 7.5: New search page

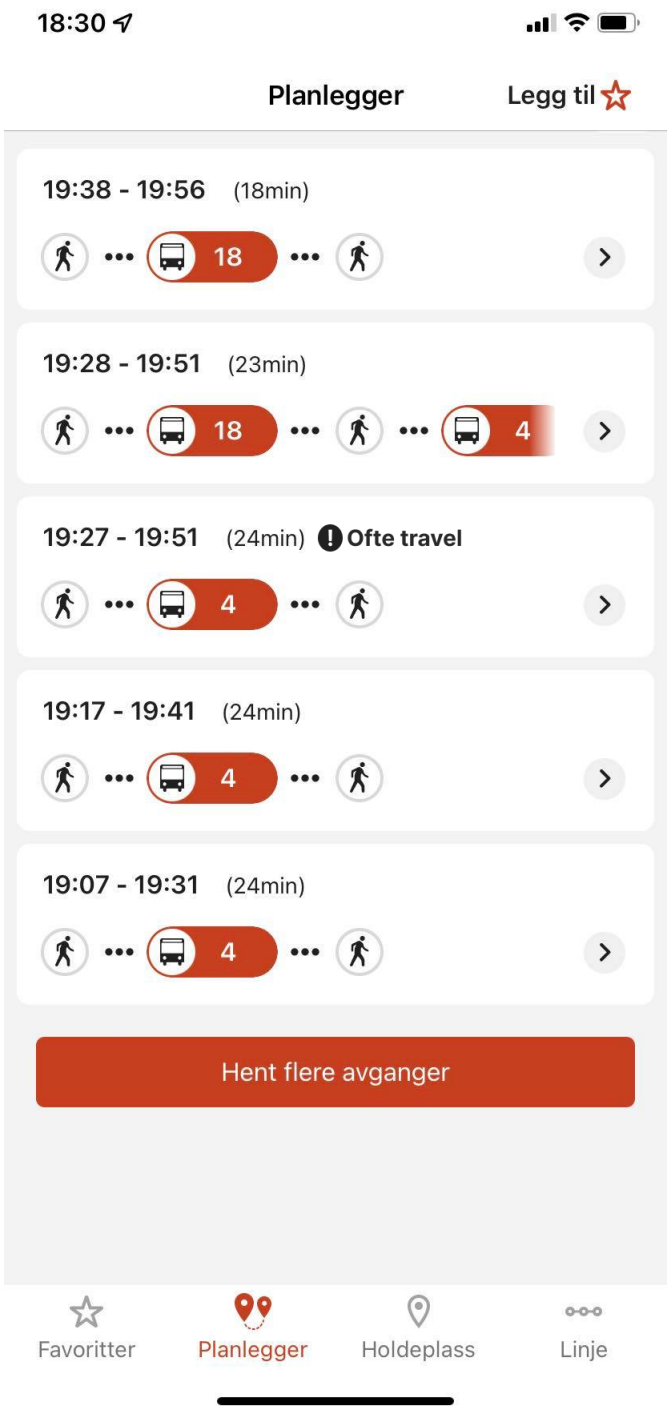

Figure 7.6: New search results

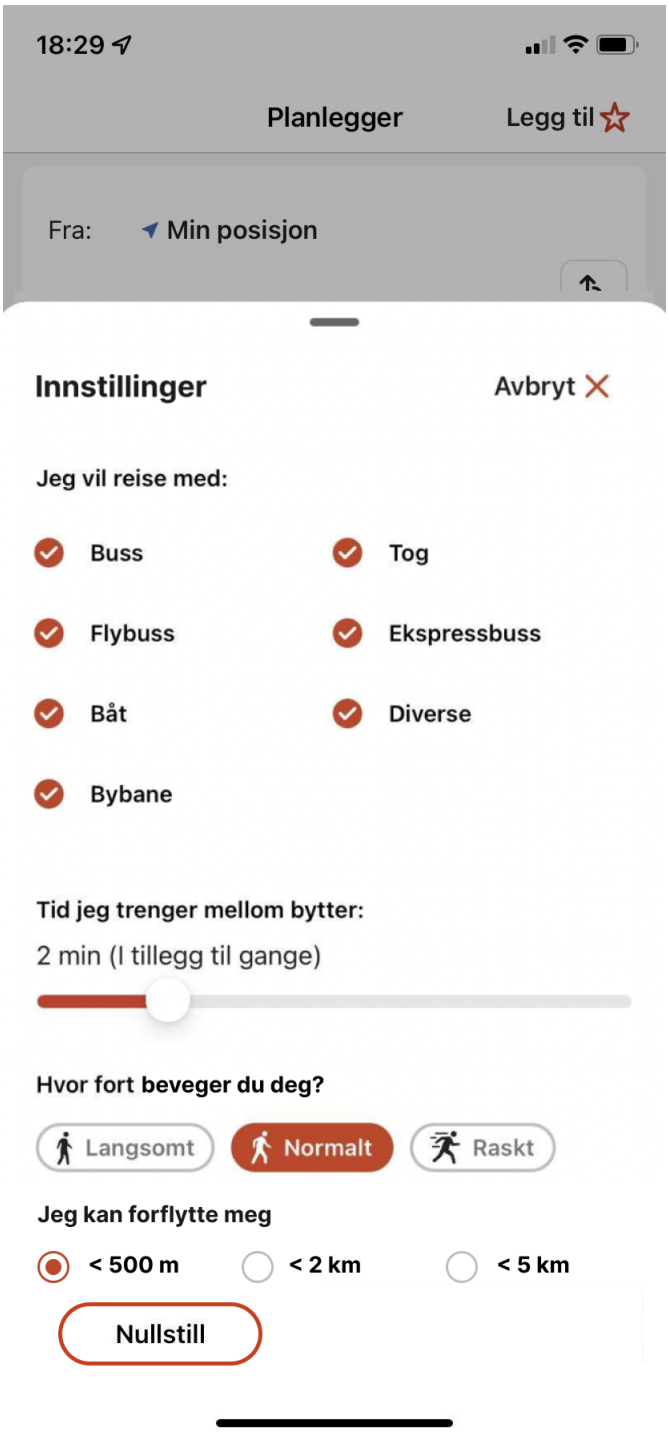

Figure 7.7: New search settings

Chapter 8

Discussion

This chapter will discuss the autoethnographic study, what I learned while conducting the field trials, as well as the limitations of this thesis.

8.1 Autoethnography

In chapter 3, the method of autoethnography is described and why I chose this particular method. Even though autoethnography is criticised as being narcissistic, too individual and using too many emotions [21], I argue that it can better capture the human experience, at least if one wishes to look at the individuals that together make up the human race.

One thing one can take from the field trials is that the minor things and experiences can be fleshed out and be a part of the bigger picture. Having the researcher be the participant themselves and then have to work through and reflect on the data collected can be valuable. As mentioned in section 3.2, being the participant gives us a confident understanding of the user since we have a deeper understanding of ourselves than other people [21], and understanding the user is a central purpose of HCI [23]. Thoughts and situations that occurred that might not seem that important to the participant at the time could be forgotten to be mentioned.

For me personally, the method turned out to be more challenging to use than first expected. Completing the field trial were more mentally consuming, however, they were not too big of a challenge to complete. The challenging part were reflecting on the findings and emotions that came up during the field trial. Trying to convey

the experiences in a reflective and informational manner, as well as not losing my own voice while making sure that anyone can read the autoethnograpic study and understand how I view those experiences mentioned in both field trials.

8.2 Assistive technology

While conducting the field trials, I did not use the smartphone "on the go". It was more of a process of stopping and using the smartphone and then continuing walking. It was very disruptive for the travelling, and when things did not work as they were supposed to, it was even more disruptive.

Since the Skyss Reise [26] app has one primary function, giving the user a route when they are planning to travel, it should be quite straightforward to use. Since I have used the Skyss Reise app before, I thought I already knew the app well, but to my surprise, I did not know the app that well. This brings us back to the aspect of involvement that Turner talked about [32]. When exploring the app more thoroughly, I noticed more functions with the app I did not previously know about, and I realised that I had never used the app to its full potential.

8.3 What I learned from the field trials

For me, the most important factor when travelling is confidence and feeling secure. I feel most secure when walking with another human, but that is not always a possibility, and I do not want to rely on always having someone with me, and that is where technology comes in. There is technology out there which can help me with the planning process, and if something comes up during travelling and would make me feel secure to a certain degree. However, there is not one single piece of technology which can do all of this on its own. One has to have many different apps which all serve different purposes. As discovered through this thesis, not all of the apps do what they are supposed to and are not always reliable. If one's primary need is to feel confident and secure, one also needs to know that the tool one is using is working and reliable at all times. There is also the factor of using many different apps and tools. It requires a lot of time to get to know them, especially if the tools are not intuitive enough. Especially when one is on the go, there is not enough time to get to know the apps and tools. When travelling, the focus is mostly on travelling, and the apps and tools should not be to hinder but to aid.

I think when I started my master's thesis, I had this underlying motive, even though it may not have been clear to me at the time, to find the tool which could help me never have to rely on another human being ever again. However, looking back at it now, I am not certain if that is possible, and I am no longer sure if that should be the goal.

8.4 Research Limitations

One of this thesis's limitations is that autoethnography is the only research method used. The autoethnographic study is based on the researchers' own feelings and experiences. Other methods would help to balance the thesis and give it a more neutral and, perhaps, some would even say a more proper academic result.

The redesign suggestions that were made for the Skyss travel planner app [26] were, for the most part, based on the experience from the autoethnographic study, and the suggestions have not been evaluated further or tested on a broader range of users. If we consider Kalbags warning about only listening to one person in section 2.1, the lack of evaluation is a clear disadvantage when it comes to making the app more inclusive and accessible.

Another important aspect is that this thesis only captures a small part of the big picture and does not grasp the extent of possible challenges I may encounter throughout my life or even on a daily basis. As mentioned in 2.1, a disability can vary even daily [20]. Although some previous experience is mentioned in the two field trials, the task of mapping out all of the different challenges and different places and situations that I meet in my life will be an impossible task to archive in a small thesis like this.

Chapter 9

Conclusion

This thesis has taken a deeper look at how autoethnography works as a research method in relation to people with a disability. The thesis has also taken a detailed look into how a person with a mobility-impairing disability navigates around a city while using their smartphone as a tool to help in planning and navigating.

9.1 My reflections on the study

My biggest takeaway after completing the autoethnographic field trial is that technology works like a security blanket, especially the smartphone. When the technology does not work as intended, it can end up being detrimental to the user. The smartphone and the apps can be great tools as long as they do as they promise and are reliable, and if an app does not do what it is supposed to in an easy and intuitive way, the app will instead become an obstacle which ends with the app not being used. When one is already out and about, it can be hard to figure out an app while on the go, making it more critical that the app is easy and intuitive.

There is also something important about human-to-human interaction, which human-to-computer interaction can never replace. However, I do not think one necessarily excludes the other. I found myself so caught up in how I interacted on my own with technology that I forgot to see if aspects of human-to-human interaction could be better applied and intertwined with the technology I was using.

9.2 Future work

The autoethnographic study gave a good starting point for further work. It would be interesting to take a deeper look at how autoethnography would work combined with other methods, such as research through design or user testing in a controlled environment.

It would be interesting to look closer at the correlation between human-to-human interaction and human-to-computer interaction and how they can work better off each other.

As mentioned in chapter 8, the redesigning of the Skyss travel planner app [26] has yet to be evaluated, and an evaluation of the design I suggested would be necessary to see if the changes improve the app the way it was intended. There are multiple ways the evaluation could be done. It could be evaluated in the same manner that the original app was, with me using a mock-up of the redesign the same way I tested the app in the completed field trial. The redesign could also be evaluated by a larger user group, with, for example, a survey to get a large quantity of data about the design, a walk-through of the app by a user in a controlled environment to see how someone other than myself respond and interact with the design, or interview either one on one or group based.

If the redesigning of the Skyss travel planner app is a success, it might be worth looking into if similar changes can be applied to other existing apps. Other apps may need a completely different approach than the Skyss travel planner app. However, if it is possible to make a guide or a blueprint for other apps based on the findings with the Skyss travel planner app, that can be extremely useful and time-saving for other navigation-related apps out there.

It is important to note that disability is a wide range and differs from day to day. My experience is not the answer to all problems when it comes to accessibility. However, more people, especially those with a disability, should do autoethnographic studies. Getting research from a more varied spectre of disabilities is essential. Autoethnographic studies that focus on people's thoughts and experiences combined with other research methods could be one way forward to a more inclusive society.

It is also important that other researchers going forward tries to include more diversity in the disability research domain and gets a broader understanding of what chal-

lenges a person with a disability might face. Including people with different disabilities in user group where the focus are not on disabilities may help to normalize universal design and make everyday challenges that people face less taboo.

Finally, I hope that you, as a reader gained more knowledge and empathy about people with disability. I also hope that after reading this thesis, you will try to look at your surroundings in a new way.

Appendix A

Screenshots

Figure A.1: The Espresso House app give the customer the option to put money in the app which can be used to pay for the order and gives the customer ten percent off

Figure A.2: A 30-day ticket for the Bergen light rail in the app provided by Skyss

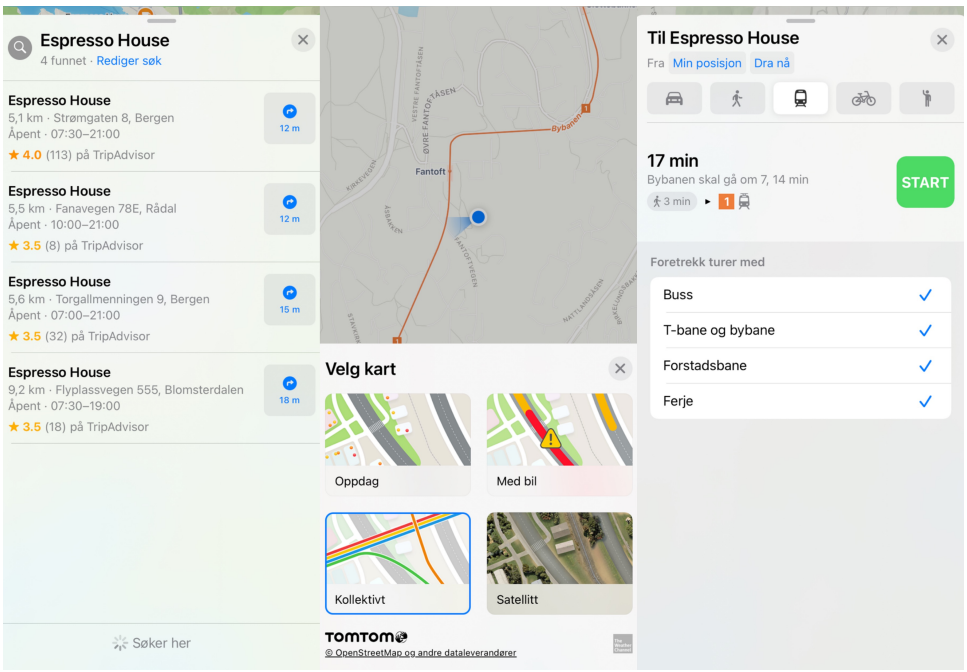

Figure A.3: Using the Map app provided by Apple to navigate to Espresso House

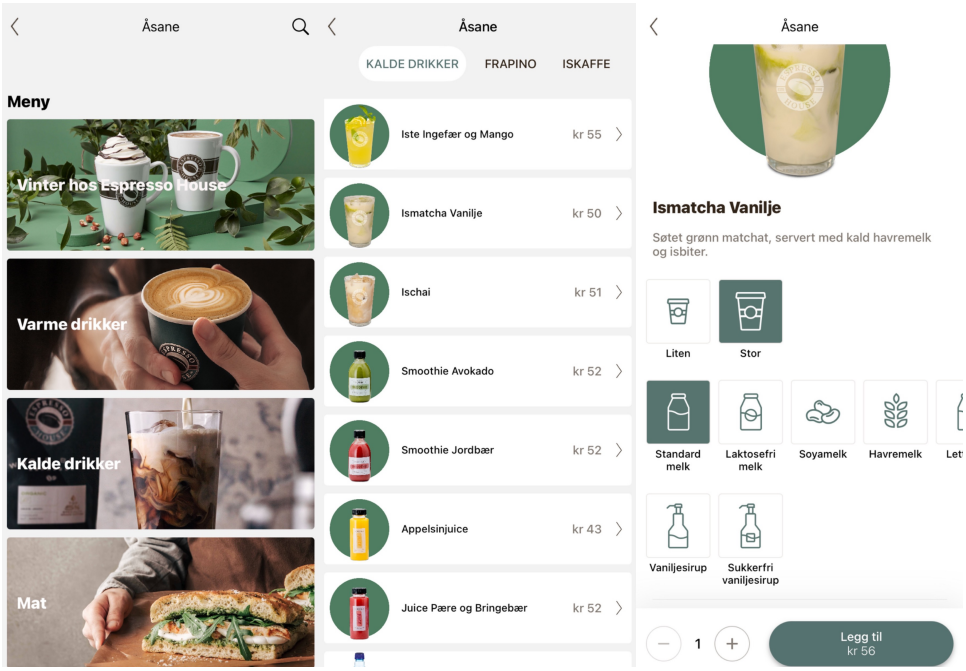

Figure A.4: The ordering process through the Espresso House app

Appendix B

Photos from field trial

Figure B.1: The sign at the light rail stop was broken

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