

Ophelia Amalie Prillard

The Design and Creation of an ICT Transportation Management Service to Increase Mobility for Older Adult in Rural Areas

Master's thesis in Engineering and ICT

Supervisor: Bjørn Haugen

Co-supervisor: Babak A. Farshchian

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Department of Mechanical and Industrial Engineering



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Abstract

Mobility is essential for the quality of life of older adults. However, in rural areas, mobility tends to decrease when older adults lose their drivers' licenses due to the lack of other adequate transportation services. The options are to either be dependent on friends and family, move to the district center, or out of rural areas. Consequently, the challenge is how to keep the older adults mobile while living at home even after driving has ceased.

Involving information and communication technologies (ICT) could be beneficial as it can help manage and organize a transportation service. Nonetheless, how the service is created and designed can impact the rate of success when implemented. Therefore, involving the users in the design process is crucial.

A design and creation research was conducted to create an ICT transportation management service that aims to utilize all the resources available in rural areas. A service design thinking process was conveyed with four participants from Folldal municipality partaking in the study. The process consisted of three stages. The first stage consisted of first, exploring the problem and finding some initial design concepts through a focus group interview. Then, within the same step, a co-design workshop was conducted to find possible design features for the service. The second phase consisted of creating a prototype based on these findings. Finally, the last step was assessing and getting feedback on the developed service through a group interview.

The findings suggest that older adults could potentially use ride-sharing services to increase mobility in rural areas. Along with the participants, the researcher found several design features that could ease the concerns associated with the service. Another finding insinuates that approaching a service culturally and environmentally is helpful for the success of a service. However, challenges related to the lack of familiarity with the service and how to change the driving mindset of the rural community are to be further investigated.

Sammendrag

Mobilitet er viktig for livskvaliteten til eldre. På grunn av mangel på tilstrekkelig transporttjenester i distriktene har mobiliteten en tendens til å avta når eldre mister førerkortet på grunn av alderdom. Alternativene er å enten være avhengig av venner og familie, flytte til distriktssenteret eller ut av distriktssområdene. Derfor er utfordringen hvordan å opprettholde mobiliteten til eldre etter tap av førerkort, slik at de kan fortsette å bo hjemme.

Å benytte seg av informasjons- og kommunikasjonsteknologi (IKT) kan være gunstig for å løse problemet ettersom det kan hjelpe med å administrere og organisere en transporttjeneste. Likevel kan hvordan tjenesten er opprettet og utformet påvirke suksessgraden når den implementeres. Derfor er det avgjørende å involvere brukerne i designprosessen.

Designbasert forskning ble utført for å skape en IKT-tjeneste som sikter på å utnytte alle ressursene som er tilgjengelige i distriktssområdet. En 'service design thinking' designprosess ble formidlet med fire deltakere fra Folldal kommune som deltok i studiet. Prosessen besto av tre trinn. Det første steget bestod både av å utforske problemet og finne potensielle designkonsepter gjennom et fokusgruppeintervju og deretter av en 'co-design workshop' for hvilke designegenskaper tjenesten bør ha. Det andre steget bestod av å lage en prototype basert på disse funnene som til slutt ble vurdert og gitt tilbakemelding på gjennom et gruppeintervju.

Funnene antyder at eldre potensielt kan bruke en transporttjeneste basert på bildeling for å øke mobiliteten i distriktene. Sammen med deltakerne fant forskeren flere designfunksjoner som kunne lette bekymringene knyttet til denne type tjeneste. Et annet funn antyder at en kulturell og miljømessig tilnærming til en transporttjeneste er nyttig for hvor godt tjeneste blir tatt i mot. Imidlertid bør utfordringer knyttet til manglende kjennskap til slike tjenester og hvordan man kan endre kjørevaner i samfunnet undersøkes nærmere.

Preface

The following research is written as a master thesis during the spring of 2021 as part of the course TMM4935 at the Norwegian University of Science and Technology (NTNU). The thesis concludes the author's degree in Engineering and ICT at NTNU.

First, I would like to sincerely thank my supervisor, Associate Professor Babak A. Farshchian at the Department of Computer Science at the NTNU, for excellent feedback and guidance throughout this project. His insights have been valuable in conducting the research and for creating this report.

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Acronyms

ICT Information and Communication Technology. 3–5, 11, 17, 19, 31, 40, 42, 43, 48, 52, 53, 63, 64, 66, 73

TNC Transportation Network Company. 13, 44

Chapter 1

Introduction

This following chapter is an introduction to the thesis, describing the motivation and problem in the first section, and then further elaborating the context, the objective of the research, the research questions to be answered, the research method and the following outline of the report.

1.1 Motivation

Mobility is a fundamental factor for maintaining older adults that are self-sufficient, content, and healthy (Felberbaum et al., 2018). Particularly since today's society requires high levels of mobility to stay connected to communities, friends, and family (Musselwhite, 2017). Additionally, a lack of social connection can precipitate mortality (Holt-Lunstad et al., 2015). Metz (2000) mentions that one of the benefits of mobility is traveling from one place to another, which often involves different transportation services.

Rural areas have a poor foundation for ordinary public transportation due to small markets and low demands (Kommunal-og moderniseringsdepartementet", 2020). The chosen mode of travel is therefore often by car. Car cessation is a concern amongst rural older adults because they might have to readjust their lives to stay mobile if they lose their driver's license when they get old. The combination of the need to drive to stay connected to society with the lack of public transportation opportunities lead to older adults wanting to keep driving for as long as possible. With age, body function problems such as sensory problems and cognitive issues can increase, creating drivers risking their own and others' lives to get around. Older adults keep driving even though their health status indicates they should not but felt like they have no other option (Choi et al., 2019). Furthermore, the road administration in Norway states that the risk of getting killed or severely injured increases with age, especially after

turning 65 (Statens Vegvesen, 2019).

An alternative transportation mode after ceasing to drive is getting lifts from friends and family (Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007). However, older adults are uncomfortable with being so dependent on others (Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007). Moreover, "some older adults do not have access to a family or to friends who can provide transportation"(Bryanton et al., 2010, p. 182). Studying various ways of improving transportation services could reduce traffic hazards and keep older adults socially connected.

"Investigating the ability of rural seniors to maintain a high quality of life given the lack of transportation alternatives available to them once they no longer drive is therefore of paramount concern" (Mullen, 2005, p. 108).

Further highlighted by Choi et al. (2019) suggesting more investigation is needed into innovation related to mobility for the elderly.

The policymakers should listen to the needs of the older adults to implement new and suitable transportation (Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007). Which transportation services are suitable for older adults may differ due to cultural and environmental factors. Mullen (2005) mentions that an area worth investigating is using "qualitative methodology to investigate people's behaviour and use of transportation systems"(Mullen, 2005, p. 108). Therefore, the research will qualitatively study how older adults use existing transportation and investigate opportunities related to different transportation services in a rural area of Norway called Folldal.

Furthermore, Choi et al. (2019) mention that "information and communication technology-based transportation management system would help maximize the use of scarce but existing resources in rural areas" (Choi et al., 2019, p. 415). Further, Cirella et al. (2019) mention that future research should investigate all transportation innovation and correlate it with "elderly persons' rate of ICT knowledge" (Cirella et al., 2019, p. 14). Examining the information and communication technology (ICT) knowledge of older adults, the qualitative results concerning transportation services, and previous studies, the researcher will create a prototype for an ICT transportation management service through using a design and creation research strategy.

"Transportation solutions for older adults that use information technology should employ user-centered, iterative design principles" (Heinz and Kelly, 2015,

p. 44). Therefore, the research will use *Service Design Thinking*, an iterative design process that can involve the users in designing a service.

1.1.1 Project Context: Smart Transport in Rural Areas

The research described in this thesis is conducted in relation to the project "Smart Transport in Rural Areas." The project is an innovation project that will develop tools and services for transportation adapted to sparsely populated areas. It is a cooperation between SINTEF, an independent research organization, Innlandstrafikken, the county's collective public transportation system, Entur AS, a digital transportation planner for all of Norway, and HelseINN, an organization for promoting better public health services. The challenge is to develop an efficient transport system for everyone, which in addition will have low costs and low environmental impact (Karahasanovic et al., 2020). For this purpose, one can take advantage of "smart transport" which, in this context, means that available resources are combined and utilized in an optimized manner.

For the entire population to benefit from the service, the researcher, also being the author of this thesis, will focus on including the population over the age of 65 as they can significantly benefit from a new or improved transportation service for reasons previously mentioned in section 1.1.

1.2 Research Questions and Objectives

The objective of the study is to find features and design concepts to an ICT transportation management service for older adults over the age of 65 that utilizes the resources available in rural areas.

To obtain the objective, the following research questions are attempted answered through this research.

1. What transportation services can be implemented in rural areas to increase mobility for non-driving older adults?
 - What are the challenges and opportunities related to transportation services in rural areas?
2. What design features should an ICT front-end to a transportation services have to be used by older adults in rural areas?

- What ICT platforms are older adults familiar with?
- What features can help solve the challenges related to transportation services?

1.3 Research methods

The research strategy chosen is *Design and Creation* as the aim of the study is to create an ICT service. To design the service, a system development method is needed, and the researcher selected to follow the principles and stages of *Service Design Thinking*. The stages consist of exploring, creating, prototyping, and implementing. The data collection methods used to answer the research questions throughout these stages are documents, observations, focus group interviews, a co-design workshop, and prototyping. The research methods are further elaborated in chapter 3.

1.4 Outline

The rest of the thesis report is structured as follows:

- **Chapter 2 - Related Research** : This chapter is used to define mobility, and show related literature on various transportation services and describe different research opportunities.
- **Chapter 3 - Research Methodology** : Detailed description of the research methodology.
- **Chapter 4 - Results and Prototyping** : Presents the results and the design features implemented in the prototype, along with the results from assessing the prototype.
- **Chapter 5 - Discussion** : Discusses the main findings along with future work opportunities and limitations to the study.
- **Chapter 6 - Conclusion** : Describes the contributions to knowledge and summarizes the research.

Chapter 2

Related research

This chapter describes previous related research for this study. The first section defines mobility and the factors and challenges influencing it. The following section elaborates the transportation services related to mobility by stating the opportunities of the service, followed by the challenges and the possible features that can handle these challenges. The subsequent section describes the research opportunities found in the previous literature, followed by features for designing for older adults. At last, a table summary of the challenges connected to the transportation services and the possible features that could ease these challenges.

2.1 Defining Mobility

Mobility as a concept is not well defined in the current literature and can have several meanings (Metz, 2000). However, Metz (2000) has attempted defining the different aspects of mobility from the perspective of what having mobility can benefit. The five elements mentioned are (1) the benefits from exercising, (2) the psychological benefits of movement, (3) the benefit of traveling to the desired place (4) the possibility of involvement in the local community, and (5) having the potential to travel spontaneously (Metz, 2000). For this research, increasing mobility refers to increasing the benefits of the last three statements regarding involvement and traveling.

2.1.1 Mobility factors and challenges

There are several challenges, both influencing and being influenced by mobility. These are illustrated in the guiding framework by Prillard (2020) in Figure 2.1.1, which also shows how mobility affects social connectedness, which

incorporates loneliness and social isolation amongst others. This framework was used to conduct a literature review elaborated in the next section.

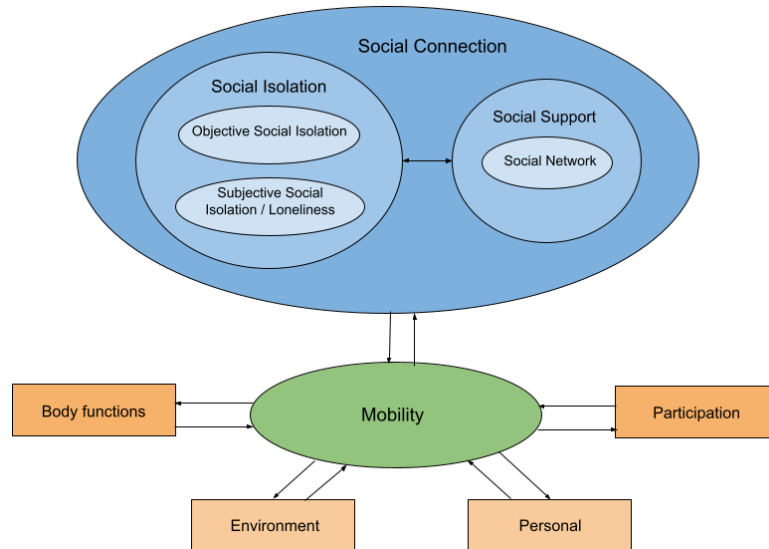


Figure 2.1.1: Mobility related factors and challenges. SOURCE: (Prillard, 2020)

2.2 Review of the Literature

A literature review was conducted to get insight into transportation services connected to digital technologies trying to improve the quality of life of older adults by increasing their mobility (Prillard, 2020). The search was conducted using the Scopus database. The search string consisted of concepts mentioning older adults quality of life - specially connected to social connectedness, transportation mobility, older adults and digital technology.

The literature review gave insight into different transportation services from both a transportation and technological point of view. The following sections are based on some of these findings, describing multiple transportation services related to the mobility of older adults.

2.3 Transportation Services for Mobility

This section describes challenges and features related to various transportation services and their potential technologies. Namely, public transportation

services, ride-sharing services, ride-hailing services, and autonomous vehicle services.

2.3.1 Public transportation Services

The primary mode of transportation after driving cessation is public transportation (Heinonen and Siira, 2016). Furthermore, many older adults can successfully reach most of their destinations where there exists public transportation service traveling on a fixed route (Bittner et al., 2011, p. 86). However, there are several challenges related to relying solely on public transport services. Especially for rural older adults that are less likely to have access to a public transportation service that satisfies their needs (Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007).

Challenges related to public transportation services

Older adults living in rural areas are less likely to access a public transportation service that satisfies their needs (Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007). Poor travel connections, lack of accessibility, being uninformed about the transport options, and cancellations of services due to underutilization are amongst the challenges the rural older adults face in public transportation (Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007). Consequently, the lack of adequate public transportation services can lead to a decrease in mobility, decreasing their social engagement (Lamanna et al., 2020).

Another challenge is related to planning and conducting the travel, such as learning how to use the transportation service and particularly utilizing it while traveling to new and unfamiliar places (Heinonen and Siira, 2016).

Furthermore, Bittner et al. (2011) mentions that transportation often is organized to conform with the working part of the population and not appropriated to the needs of older adults traveling outside peak hours. The article further mentions that older adults can often live far from a transit stop or have to reach a destination far from a stop. This problem can be translated to having a first and last-mile challenge.

Features that can aid public transportation services

The article by Bühler et al. (2014) creates a prototype of an assistant the older adults can bring with them while traveling as a way of easing the challenge of switching stations when traveling to new places, amongst others. One feature is providing the possibility to call a human and get individual assistance.

A possible solution to the lack of adaptive and flexible transportation is to implement a "hybrid service" using other vehicles, such as busses, vans to ease the first and last mile challenge (Bittner et al., 2011, p. 86).

Lamanna et al. (2020) mention that a way of handling the challenge of being uninformed regarding transportation options is to engage older adults to participate in learning programs before car cessation. However, if there are no adequate options, others transportation services should be investigated, such as ride-sharing services.

2.3.2 Ride-sharing services

A possible definition of sharing a ride is a "transportation option in which two or more individuals who are traveling to the same destination or on route to the destination, share the cost of a ride in a taxi, bus, car or shuttle (Commission on Aging, 2012, p. 3).

An advantage to sharing a ride or getting a lift is that the transportation mode resembles driving one's private car (Davey, 2007). Moreover, having a type of alternative transport available all day and bringing passengers from door-to-door is especially important for older adults with trouble walking or other similar challenges (Metz, 2003).

Choi et al. (2019) mention that ride-sharing with friends and neighbors already is "the primary means of transportation for older adults without driving mobility"(Choi et al., 2019, p. 423). Research shows, however, that there are several needs and challenges related to ride-sharing.

Ride-sharing needs and challenges

Payyanadan and Lee (2018) research on the ridesharing needs and challenges of both rural and urban older adults. The study uncovered four general challenges related to sharing a ride, namely "limited social network, efficient com-

munication of trip details and needs, and establishing trip reliability and privacy" (Payyanadan and Lee, 2018, p. 155). Rural older adults were primarily concerned with safety, such as vehicle and road standards, and planning issues, such as not knowing the pick-up and drop-off locations. The participants also highlighted that the system should be reliable for getting to appointments and for buying groceries. Other notable concerns were related to the time they have to wait for the ride and that cancellations should be within a reasonable timeframe.

The results in the article by Heinz and Kelly (2015) also mention the concern of reduced flexibility, having to wait or rely on others, and safety regarding the drivers' ability or responsibility for their passengers. In addition, the participants wanted to know the driver personally. Another result was that the system had to be tested and obtain a reputation before the older adults could trust it.

Even with a trusted system, Yamamoto and Zhang (2017) highlights that accepting lifts from others comes with negative aspects related to the driver having to adjust their schedule and privacy concerns when going to medical appointments. Furthermore, the article by Yamamoto and Zhang (2017) also mentions with regards to asking and accepting lift that there is a "reluctance of older adults to be "indebted" to others "(Yamamoto and Zhang, 2017, p. 192).

The study by Davey (2007) also mentions the challenge of reciprocity. The participants did not want to feel obligated to a friend for accepting a lift. The challenge is how the older adults can feel comfortable saying yes to a ride. The research also mentions the challenge of asking for a ride as "most participants hated asking and found it embarrassing"(Davey, 2007, p. 61).

Both Heinz and Kelly (2015) and Payyanadan and Lee (2018) describe ICT prototypes that potentially could manage and encourage ride-sharing. However, with this comes the challenge of technology for some older adults. For example, in the study by Choi et al. (2019), none of the rural elderly used smartphones. Technology was also an obstacle in the research by Heinz and Kelly (2015) as "participants' computer use was moderate to nonexistent" (Heinz and Kelly, 2015, p. 44). Furthermore, in the study by Payyanadan and Lee (2018) rural older adults had problems setting up a ride as they did not have adequate access to phones or the internet (Payyanadan and Lee, 2018).

On the other hand, Vroman et al. (2015) mention that evidence shows that ICT use among the elderly is increasing. This statement is highlighted by Slettemeås et al. (2018) describing that 95% of the older adults between 61-100 years old in Norway have a cellphone or a smartphone in 2018. The number of smartphones in this age-category increased from 37% percent in 2014 to 67 %

in 2018 (Sletteameås et al., 2018). Further mentioning that the daily use of social media, the internet, and mail have also increased during this four-year gap. Moreover, the statistics from Statistisk sentralbyrå (2017) describe that Norway is one of the highest-ranked countries in Europe on having digital skills for the population aged 16-74.

Possible ride-sharing features

The previous literature also describe features that can attempt to solve some of the concerns of the older adults towards sharing a ride. In addition, the feedback on what the participants liked and disliked are also possible features that could motivate the use of this service.

The rural participants in the study by Payyanadan and Lee (2018) had several further suggestions for the ride-sharing prototype. One of the recommendations was that the service should offer not only one-way trips but also round tours. This idea can tackle the challenge related to the lack of flexibility and ease of planning and scheduling.

Having a limited network is a challenge related to ride-sharing, especially due to the concerns associated with riding with strangers. Consequently, a service should implement features to expand the older adults' network while still knowing the drivers. For example, the ride-sharing prototype by Heinz and Kelly (2015) implements a "Primary circle" of friends and family and a "Secondary circle" - consisting of the people connected to a person's primary circle. This idea could be a possible solution for both the concern of a limited social network and sharing a ride with a stranger. Similarly, the prototype by Payyanadan and Lee (2018) extended the social network by being able to ride also with a "'friend of a friend' and 'friend of a family'" (Payyanadan and Lee, 2018, p. 160). However, the participants further suggested that the drivers should only be from the same community or area. Yamamoto and Zhang (2017) also highlighting "the importance of community networks in promoting shared mobility in rural areas" (Yamamoto and Zhang, 2017, p. 192).

To tackle the issue concerning privacy, the prototype by Payyanadan and Lee (2018) included "privacy controls, where older adults can determine whom they are willing to offer rides to, even in their extended social network" (Payyanadan and Lee, 2018, p. 161).

The participants in the article by Davey (2007) felt more comfortable accepting a ride if the driver offered a ride rather than having to ask. The prototype by Heinz and Kelly (2015) made it possible for participants to post a request

rather than asking in person, which was a feature the participants enjoyed. At the same time, the ride is offered freely by the drivers that want to accept the request. Another way of solving the problem with asking could be that the organizations providing various activities also could manage rides for those in need of transport (Davey, 2007).

Furthermore, Davey (2007) discuss that a possible solution to the concern of reciprocity could be "green dollar' schemes, guidelines on how much to give, or making petrol vouchers available in more outlets"(Davey, 2007, p. 62). Similarly, the checklist of transportation features to include for older adults for "Community Transportation Services" by Federal/Provincial/Territorial Ministers Responsible for Seniors (2007) describes that the drivers either from a social network or volunteering, should be "compensated (e.g., gas money) for their efforts "(Federal/Provincial/Territorial Ministers Responsible for Seniors, 2007, p. 41).

2.3.3 Ride-hailing service

Ride-hailing services, also known as Transportation Network Company (TNC) services, and ride-sharing services have many similar qualities, and will therefore have several similar challenges and features. Some articles even mention ride-hailing as dynamic ride-sharing (Leistner and Steiner, 2017). Users use dynamic ride-sharing to avoid planning and scheduling as users request rides in real-time. Unlike ride-sharing mentioned in the section above, the driver is usually unfamiliar and paid to drive from your location to your desired address, regardless of the drivers' destination (Leistner and Steiner, 2017).

Talmage et al. (2020) suggest defining ride-hailing "as a service where a vehicle providing a ride from an origin to a destination is hailed via information and communication technologies, such as a smart phone or computer"(Talmage et al., 2020, p. 5-6). Uber and Lyft are example of transportation network companies that provide ride-hailing.

Shirgaokar (2018) discuss that soon, TNC and ride-sharing will be low-cost alternatives compared to taxis. It can be a more flexible option to a "fixed-route transit service" , and since it is a door-to-door service, it can increase accessibility (Leistner and Steiner, 2017).

The study by Talmage et al. (2020) mentions that older adults would consider using ride-hailing services when they no longer could drive. The results also stated that the participants in lack of social connection were more open to using the service. However, that "(75.8%) of the respondents would not leave

their residential community more if a driver was available to them upon demand"(Talmage et al., 2020, p. 15). A result showing that there are challenges related to ride-hailing services.

Ride-hailing challenges

Shirgaokar (2018) mention the issue of trust related to the ride-hailing system. The participants in the study perceived Uber as "being 'unlicensed and unregulated' and having 'drivers without proper qualifications'"(Shirgaokar, 2018, p. 410). Also, the lack of familiarity with the ride-hailing system can affect the trust in the system. Shirgaokar (2018) further mentions that if the users perceive the service as useful, they are more likely to trust it as well. The challenge of trusting the service leads to concerns about riding in a regular car and paying through the phone application. Another concern was not being able to follow a taximeter regarding the cost of the ride (Shirgaokar, 2018).

Furthermore, the interest in ride-hailing services was low because they are intimidated by the technology (Shirgaokar, 2018). A related challenge is the lack of familiarity with using smartphones making it difficult using the service (Leistner and Steiner, 2017).

One other main challenge for older adults towards ride-hailing is that they need to ride along with strangers (Leistner and Steiner, 2017). As in the study by Heinz and Kelly (2015) mentioning how older adults only are willing to ride along with people they know.

Another challenge related to ride-hailing in rural areas is the spread of the population over a large area. Choi et al. (2019) discuss that dynamic ride-sharing is usually easier to implement in areas with a dense population.

Ride-hailing features

Based on qualitative interviews, the article by Shirgaokar (2018) provides features that could increase the use of ride-hailing applications such as Uber and Lyft. Some of these features include offering travel comparison, showing details about the driver, redesigning the technology for older adults, provide the possibility of scheduling regular trips(Shirgaokar, 2018). Shirgaokar (2018) also mentions that other transportation modes can implement these features.

Learning and training on how to use the ride-hailing technology could help ease the worries concerning the system (Leistner and Steiner, 2017). Also,

learning the users why it is beneficial can help mitigate the concerns regarding the service (Talmage et al., 2020). Because the older adult will not be interested in learning about it or use it unless "that new technology can help improve his or her life"(Shirgaokar, 2018).

2.3.4 Autonomous vehicle services

Shirgaokar (2018) mention that ride-hailing services can contribute to improved mobility for the older adults of today, but that "[a]utonomous vehicles may indeed increase mobility for seniors in the future "(Shirgaokar, 2018, p. 410). The lack of independence due to a decrease in mobility can potentially be solved using autonomous vehicle technology (Eimontaite et al., 2020). Making older adults good candidates as early adopters of the technology.

Autonomous vehicles challenges

The older adults' lack of trust in the system is causing a low user acceptance, making it a challenge for autonomous vehicle services (Abraham et al., 2017).

Furthermore, in the survey conducted by Hassan et al. (2019), the older adult lack interest in autonomous vehicles compared to the younger generation. However, describing a higher interest amongst the elderly who more often used other transportation modes than their car.

Autonomous vehicles features

The article by Eimontaite et al. (2020) describes that a way of enhancing trust is by communicating openly and clearly the behavior of the vehicle. The study concluded that getting the information in writing and audio helped the participants trust and relax during user testing.

Furthermore, developing training programs can potentially make older adults understand more of the technology, which can increase the interest in autonomous vehicles (Hassan et al., 2019).

2.4 Research Opportunities

The following section highlights research opportunities related to the transportation services.

2.4.1 Learning

There are two learning opportunities mentioned within the articles, namely learning about the technology and its importance, and learning and training on how to use technology. As Lamanna et al. (2020) mention that learning about their transportation option could ease the transition to a non-driving life. Furthermore Vivoda et al. (2018) mention how much knowledge the user had about the ride-hailing technology could predict their use.

On the other hand, Leistner and Steiner (2017) mention how learning and training on how to use ride-hailing technology can ease the worries connected to the system. Also mentioned by Heinz and Kelly (2015) for developing "computer skills"(Heinz and Kelly, 2015, p. 44). Furthermore, learning about its benefit can also influence the use of the technology (Shirgaokar, 2018).

Furthermore, Hassan et al. (2019) mention that learning could "increase awareness and understanding of autonomous vehicles"(Hassan et al., 2019, p. 479). This describes the opportunity that lies in learning about the technology.

2.4.2 Contextualizing transportation services

Yamamoto and Zhang (2017) highlights the importance of investigating transportation behavior in context to avoid assuming needs and possible transportation methods that are not applicable in that area or community. Social factors and cultural aspects influence the way residents handle their mobility (Yamamoto and Zhang, 2017). Therefore, exploring cultural attitudes could give insight into how a service can, amongst others, facilitate the asking for a ride for older adults (Yamamoto and Zhang, 2017). The article further mentions that current research is not sufficiently investigating transportation mobility from a cultural perspective.

Payyanadan and Lee (2018) also mention that future research should explore the trust culture amongst the members of a community is essential to "suc-

cessfully establishing such community-driven services"(Payyanadan and Lee, 2018, p. 162).

2.4.3 Combining socializing with transportation

There lies potential in combining the possibility of being social with transportation opportunities. The study by Vargas-Acosta et al. (2019) mentions that to fulfill the requirements for transportation service is to have the possibility to create and use the application to socialize as well. The study further mentions providing options for social events and recreational activities for extending their network, preferably through community groups or other related agencies.

2.5 Designing for older adults

Some of the articles found in the literature review mention design features that could promote ICT use for older adults. Firstly, Shirgaokar (2018) mention that "larger fonts, fewer icons, better contrast" are among features that can make the front-end of a service more user-friendly (Shirgaokar, 2018, p. 412).

Furthermore, the paper by Vargas-Acosta et al. (2019) describes that the older adults enjoyed that they can adjust the font size of the ICT front-end. Another related feature is personalizing the layout to show only the functionalities concerning the individual using the service (Bühler et al., 2014). Moreover, choosing and personalizing the design is important since older adults are not uniform and have different preferences and needs.

In the study by Bühler et al. (2014), the public transport system created had the possibility to display either the abstract map or the realistic map with photos and arrows, based on the fact that seniors are not a uniform group. A statement supported by participants in the study by Heinonen and Siira (2016), proposing to customize according to their needs and "ICT skills". Older adults have mixed levels of digital competencies and should have the possibility to customize the design accordingly.

2.6 Summary of Related Research

A summary of the related research found on the various transportation services is shown in Table 2.6. The summary connects the transportation services with their challenges and the possible features to handle these challenges found in the related research.

Transportation Service	Challenges	Possible Features
Public Transport	Inadequate First and last mile Overwhelming	Human telephone assistance Learning about the options Hybrid transportation service
Ride-sharing	Trust & Reliability Limited Network Privacy Inconvenience Reciprocity Asking Planning & Scheduling Flexibility Communication Technology	Round trips Friends of your friends Possibility to be selective Posting a request, rather than asking Compensation for the ride
Ride-hailing	Unknown drivers Quality of the drivers Unlicensed Lack of visualization Not a trusted system Intimidating technology	Travel comparison Details about the driver Designing technology for older adults Scheduling repetitive trips
Autonomous vehicles	Trust the system Safety	Audio features Learning about the technology

Table 2.6.1: A summary of the challenges and opportunities related to transportation services.

Chapter 3

Research Method

The following chapter describes the research approaches and methods used in this project. The chapter starts by detailing the research strategy chosen for the research. Then elaborate on the design process method for developing the service. This followed by describing the design process along with the data generation methods use during it. Further, how the data is analyzed is explained, and finally, research reflections and ethical considerations surrounding data collection are reviewed.

3.1 Research Strategy

The research strategy for the project is called *Design and Creation*. The focus of this strategy is to create "new IT products, also called *artefacts*" (Oates, 2006, p. 108). The artifact and the knowledge created through the process of creating the artifact is the contribution to knowledge. It can be a construct, a model, a method, or an instantiation (March and Smith, 1995). A construct can be a concept from the vocabulary used in a field (March and Smith, 1995). Models combine constructs to interpret situations to help understand the problem, while methods are the processes used to develop the computer-based system that can solve the problems. Further, an instantiation is described as "the realization of an artifact in its environment" (March and Smith, 1995, p. 258). The purpose is to demonstrate artifacts like the ones mentioned, or also theories and ideas using a "computer-based system" (Oates, 2006, p. 108). The study aims to create the ICT front-end of a transportation management service based on previous knowledge and new knowledge gained through various data generation methods through a design process. The output is, therefore, a combination of constructs and instantiations.

To rigorously design a system, the researcher should implement a develop-

ing method that consists of analyzing, designing, implementing, and testing (Oates, 2006, p. 112). For this project, the method chosen is *Service Design Thinking*. The following section describes what service design thinking is and why selected for the study.

3.2 Service Design Thinking

The chosen development method to design and create the computer-based system is service design thinking. Service design thinking is a user-centered design approach (Stickdorn and Schneider, 2011). In user-centered design, the users often participate in every stage of the design of a service, and the focus is on their needs. According to Stickdorn and Schneider (2011), service design thinking has no common definition; however, not being restricted by a definition is one of its strengths.

Service Design thinking is based on five principles. These are that the design process should be user-centered, co-creative, sequencing, evidencing, and holistic (Stickdorn and Schneider, 2011). Including end-users is essential as the intention behind creating a service is usually to solve the customer's needs. Having a process based on co-creation means including the potential stakeholders while designing. Service design thinking comes with various ways of interacting and developing with the stakeholders and is based on that "Everyone can be creative!" (Stickdorn and Schneider, 2011, p. 24). Another reason for co-creation is that users most likely get more engaged and more willing to use the service. The following principle is sequencing, meaning that the designer should split up and explore the service as consisting of several sequences. With the case of transportation, this could mean splitting into the planning, the transporting, and the arrival. The principle of evidence is to make tangible what is not usually tangible to reveal other more hidden services (Stickdorn and Schneider, 2011). Finally, a holistic approach means that the design should see the service in the bigger picture, as in the environment it will be implemented. Furthermore, with using service design thinking comes a toolbox for methods and ways of interacting and designing. These methods are used during the iterative design process of service design thinking and elaborated through section 3.3.

Choosing service design thinking

Service design thinking is focusing on the process of designing a service that is "useful, usable, desirable for clients and efficient as well as effective for or-

ganisations"(Stickdorn and Schneider, 2011, p. 18). This quote resonates with the objective of this study: to create a new or improved transportation service that is beneficial for a community. Nonetheless, Stickdorn and Schneider (2011) specifies that the end-user experience can profit from applying service design thinking when designing for the transportation sector. A final reason for choosing service design thinking is that the method comes with a toolbox with various approaches and methods for exploring, defining, and creating a service.

3.2.1 An iterative design process

Stickdorn and Schneider (2011) describes the iterative design process using four stages, namely exploration, creation, reflection, and implementation. "Service design thinking is not only iterative during the process of the presented four stages, but also within each stage, within each workshop, within each brainstorming session"(Stickdorn and Schneider, 2011, p. 93). Table 3.2.1 summarize the design process using the four stages of service design thinking. The table describes which data generation methods were used during which stage, along with the resulting knowledge and where the reader can find the different steps in the report. The primary focus of the research is on the three first stages. However, the implementation stage is discussed based on the results from the previous stages in chapter 5. The following section elaborates on these stages.

Stages	Data Generation Methods	Results	In Report
Exploration	Documents Observation Group Interviews Co-Design Workshop	Challenges and opportunities Design features	Section 4.2
Creation	Prototyping	An interactive prototype with implemented features	Section 4.3
Reflection	Group Interview	Feedback on the prototype Other Challenges	Section 4.4
Implementation	Using knowledge gained from previous stages	Discussion of behavioral change	Subsection 5.2

Table 3.2.1: An overview of the design process.

3.3 The Design Process

This section describes the design process using the four stages of service design thinking. For each step, the data generation methods used are described both theoretically and practically. However, before describing the process, the participants and how they were recruited to partake in the process are described.

Recruiting participants

The recruiting of the participants was done with the help of a contact at SINTEF Digital. Since they are collaborating with the community of Folldal for the "Smart Transport in Rural Areas"-project, they helped the author get in touch and set up a meeting with a person working at the volunteer center. The volunteer worker helped to recruit the older adults. A total of four participants participated in the process. They consisted of three older adults, between the ages of 77-84, and the middle-aged volunteer worker. All of the participants participated in the first two stages. However, one participant could not be present during the last stage. The following sections describe how the participants were involved, starting with the exploration stage.

3.3.1 Exploration stage

The first stage aims to discover and define the problem. It involves understanding and clarifying the situation from the user's perspective (Stickdorn and Schneider, 2011, p. 91). The stage is not for finding solutions to a problem but instead identifying it. When the problem is defined, the designer can start trying to visualize some of these findings. The focus of the stage is, among others, related to the user's needs and inner motivation.

In this research, the exploration stage consisted of gathering and analyzing documents, observations, a focus group interview, and a co-design workshop. First, transportation and socializing needs and behaviors were explored in the focus group interview. Then, the researcher used the data collected from the first interview to obtain early concepts and design ideas that were further elaborated and generated through the workshop. Finally, the found documents and observations were used to enrich the findings. The practical and theoretical aspects of the data generation methods are elaborated in the following sections.

Documents

Documents are one way of generating data for a research (Oates, 2006). Oates (2006) describes that documents can either be *research-generated* or *found documents*. The research-generated documents were not there prior to the research, such as notes, interview transcriptions, and photographs. The found documents are the ones that already existed before the research, such as previous literature, annual reports, and statistics. When using found documents, it is important to investigate the credibility of these documents.

In this research, the found documents consisted of the literature from previous research, documents related to transportation in district areas, and related to the hometown of the participants, namely Folldal. The website connected to Innlandstrafikken, the county's collective public transportation system, publishes annual reports on the changes made to the transportation service and results from questionnaires on the transport's satisfaction. Furthermore, the website holds the timetables of the bus routes going in and out of Folldal. These found documents were examined to gain a complete picture of the transportation service in Folldal and supplement the findings from other data generation methods.

Interviews

To gain information from the participants, a researcher can use interviews to generate a planned discussion Oates (2006). Interviews can be structured, following a set of questions, or unstructured, by only introducing a theme to get the participants talking, or semi-structured, meaning having a question guide but still following the conversation's flow. Interviews can also be one-on-one or in groups. The researcher chose to conduct group interviews, both in favor of generating discussion amongst the participants and since interviews are a time-consuming data generation method.

A focus group interview is a type of group interview "investigating community issues rather than personal experiences" (Preece et al., 2015, p. 338). Additionally, focus groups are a way of letting the older adults explain how they feel about transportation and gaining knowledge on their issues related to transport (Mullen, 2005). The interview is usually transcribed and analyzed. However, it can be challenging to transcribe as people can tend to talk at once.

First, the researcher chose to conduct a semi-structured focus group interview to let the participants speak their minds since the aim was to explore and

discover (Oates, 2006, p. 188). The role of the researcher was to ask questions and lead the discussion if it derailed. The readers can find the interview guide in Appendix C. However, following the flow of the conversation, the themes and questions were not addressed in the order displayed. The focus group interviews were conducted digitally with the help of a worker at the volunteer center in Folldal. Investigating their transportation, social and cultural behavior along with their use of ICT was the focus of the interview. In addition, the researcher asked about the different sequences of the transportation journey based on one of the service design thinking principles. The interview lasted one hour and was then recorded with permission from the participants.

The researcher gathered another type of interview through email correspondence with a resident from Kvikne, situated in Tynset, a neighboring municipality of Folldal. The interview consists of the individual answering about a ride-sharing program they tried to implement on the community website for Kvikne, but that they recently have removed due to absence of use. The answer describes why they tried creating a ride-sharing service and possible reasons that it did not get used. The readers can find the email in Appendix B.

Co-design workshop

A workshop is a type of group interview that lets users be able to contribute to the development process (Preece et al., 2015). The researcher chose to create a design workshop that, on the one hand, explored further what kind of digital tools and applications they are familiar with, their usage, and opinions on them. And on the other hand, of getting ideas of how a future possible transportation and socialization platform could behave and operate.

The researcher incorporated the method of using design scenarios, idea generation, and the "What if" method from the service design thinking toolbox (Stickdorn and Schneider, 2011). Firstly, design scenarios are described as "hypothetical stories" and are supposed to make the service relatable to envision how the user could use it (Stickdorn and Schneider, 2011, p. 140). Secondly, the research also used an exercise based on the idea generation method, which is used as an ice-breaker and for starting the thinking process of the participants. Lastly, the 'What if' method was used by adding elements to the scenarios "to provoke participants to explore potential future situations"(Stickdorn and Schneider, 2011, p. 138). The workshop was described to the participants using a PowerPoint presentation. The interviewer followed a guide for the workshop, which the readers can find in Appendix C. This part aimed to let the participants be creative and try to find solutions. The researcher analyzed the results from the workshop along with the previously mentioned group interview as

described in section 3.4.

Observation

Observation consists of generating data by watching and taking notes of what participants do rather than what they might say during interviews (Oates, 2006). The observation in this study consists of observing how the older adults use a social media group on Facebook. During the group interview, subsection 3.3.1, the group was mentioned to the researcher and seemed to be an interesting area for observation. For record-keeping, the researcher took some notes while observing. The Facebook group is called *'Du vet du er Folldøl når:'*, 'You know you are from Folldal when:', and have over 2,300 members with people either living in Folldal, have a connection to Folldal or having moved out of Folldal. The observations showed that it is mostly used to post and comment on old photos and nature photos, for sharing events, and seldom for transportation-related services. Nonetheless, it is a group substantially utilized by the older generation. The observation of the group is elaborated throughout the findings in chapter 4.

For ethical considerations, the researcher posted on the group prior to observation. The post was to inform about the project and that the research would observe what is being posted in the coming weeks. Telling the participants that they are going to be observed made it an "overt" and not "covert" research (Oates, 2006, p. 203).

3.3.2 Creation stage

Reviving both the data from the first interview and the workshop lead to the creation stage. The creation stage consists of designing and creating the concepts found in the previous step (Stickdorn and Schneider, 2011, p. 93). This phase and the reflection phase are closely related and usually where many iterations are carried. A prototype was created based on ideas and concepts found through the earlier stage and prior knowledge from reviewing the literature.

Prototyping

"A prototype is one manifestation of a design that allows stakeholders to interact with it and to explore its suitability" (Preece et al., 2015, p. 539). The

prototype was created based on the knowledge gained from the focus group interview and on the results from the design workshop. The data is the basis for finding requirements and design features. Creating a prototype is beneficial for discussing ideas with the users (Preece et al., 2015). Having a service prototype is also one of the methods mentioned for service design thinking Stickdorn and Schneider (2011).

The prototype was created using Figma, which is a prototyping tool that helps "[c]reate prototypes that feel like the real experience" (Figma, 2021). Along with Figma comes the applications Figma Mirror, which makes it possible to share the prototype directly on the device of the users. The prototype was created so that users could interact with it. However, due to time constraints, it was not fully interactive. Since some buttons could still not be pressed, the researcher created a step-by-step plan to follow the most intuitive way of managing the prototype.

3.3.3 Reflection stage

After creating a prototype version, it should be tested to obtain feedback and then be improved until the users are satisfied and the prototype is as expected (Stickdorn and Schneider, 2011, p. 95). The researcher received feedback on the prototype through a focus group interview.

Prototype feedback

The third group interview was conducted to obtain feedback on the prototype. This interview lasted almost two hours. This interview also used the service design thinking method of using design scenarios, as previously described in subsection 3.3.1. The participants were taken through five different scenarios, as five different ways to use the service. This interview was also transcribed and analyzed as described in section 3.4. The researcher explained these scenarios to the participants digitally through a PowerPoint presentation. The interview guide in Appendix C details these scenarios.

3.3.4 Implementation stage

"The implementation of new service concepts by necessity demands a process of change" (Stickdorn and Schneider, 2011, p. 97). Theories related to managing

change describe the process as planning, implementing, and reviewing changes (Cameron and Green, 2009). Where and what the change of behavior should be for a service is formulated during the previous steps. Unfortunately, the prototype in this study is not implemented, but the stage is further discussed in the chapter 5.

3.3.5 Limitations regarding the data generation

The focus group interviews could have benefited from recruiting more participants. The aim was initially to get between 5-10 participants. However, the recruiting process was challenging due to the current Covid-19 pandemic affecting Norway since the researcher wanted to get in touch with a group at risk. Consequently, not being able to get to rural areas in person and recruit made it difficult.

At last, the participants were recruited with the help of the volunteer worker as mentioned in section 3.3. The volunteer center usually gathers many older adults for socializing and exercising. However, due to the pandemic, they were not including as many as usual in their activities at the time of recruitment. Several documents were shared to inspire and motivate the participants through the worker. Amongst those were sending documents explaining the project and a PowerPoint presentation to show the importance of involving the users in creating a service. This inspired three older adults to contribute, and the worker herself. Since the worker worked closely with the older adults, she had great insights into their behavior and needs.

Furthermore, the workshop was supposed to focus on co-designing the service by interacting with the participants using props and various creation methods. However, due to having to have the workshop digitally, co-designing was challenging. A co-design workshop would have the users take a more active role in designing the service by drawing and using tangible objects. As a result, the design has been attempt co-designed and influenced by the participants as much as possible, but the researcher had to create the actual designs.

Another limitation concerning the focus group interview is that the interviewer had no moderator to take notes. Having a moderator taking notes during the interview and ask follow-up questions could have benefited the process. The interviewer, also the researcher, had trouble always hearing what was said and detected several opportunities for follow-up questions while transcribing the sound record.

3.3.6 Limitations regarding the design process

The design process for this project is based on the service design thinking principles, going through three out of the four stages of the iterative process and using appropriate service design methods and tools. However, this is only a first step towards a fulfilling service design.

Firstly, due to time restrictions the project mainly looks into the older adults' perspective, but should with further iterations, include more stakeholders in the process. The final stage consists of implementing the service is also for further work as a behavioral change is usually needed for successful implementation.

Secondly, due to having digital data generation methods, following the principles of evidencing and iterating for service design thinking, mentioned in section 3.2, was challenging. The researcher did not want to impose too much on the volunteer worker, which affected the number of iterations for designing and prototyping with the older adults. Also, being physically present during the steps to create a service could have made them open more during the exploration phase.

In addition, the process would have benefited from a physical design workshop using tangible props and being present rather than discussing designs digitally. This would have enhanced the evidencing principle of service design thinking. However, the process was successful using the resources available at the time. To sum up, the project is a step towards a fulfilling service design process but can be further explored and iterated.

3.4 Data Analysis

The method chosen for analyzing data is often based on what kind of data has been collected. Analyzing quantitative data differs from analyzing qualitative data. Data analysis also depends on the type of data generation methods used. The researcher chose to analyze the data using thematic analysis which is a qualitative approach.

3.4.1 Thematic analysis

The data analysis was conducted using a thematic analysis approach. "Thematic analysis is a method for identifying, analysing and reporting patterns (themes)

within data"(Braun and Clarke, 2006, p. 6). The thematic analysis consists of creating themes based on the data. "A theme captures something important about the data in relation to the research question, and represents some level of patterned response or meaning within the data set"(Braun and Clarke, 2006, p. 10). Further, the questions the interviewer asks the participants should not be "the 'themes' identified in the 'analysis'" since then it would not be analysis (Braun and Clarke, 2006, p. 85).

There are several ways of conducting a thematic analysis and various decisions to be made (Braun and Clarke, 2006). The first decision is whether the analysis is conducted inductively or deductively. The inductive approach is related to grounded theory as it is grounded in the data available, meaning that the themes are not predefined but rather based on the data. On the other hand, the deductive way consists of analyzing the data using the research questions, or some predefined themes (Braun and Clarke, 2006).

The data coding was done inductively, as the focus of the analysis was on the actual data gathered during the interview. However, the researcher made the interview guide based on prior knowledge from the literature, giving the overall analysis a deductive dimension.

The next decision is surrounding "the 'level' at which themes are to be identified"(Braun and Clarke, 2006, p. 13). It can be on a semantic level, meaning that the search for themes goes beyond what is being said and what is being spoken in between the lines. On the other hand, it can be on an explicit level, where the search for the themes does not go beyond the "surface meanings of the data"(Braun and Clarke, 2006, p. 94). The latter often being connected to the interpretivism research paradigm. However, having a positivism research paradigm and being interested in what they are saying about transportation services rather than investigating the more profound meaning, the analysis kept on a semantic level. Having the decision of the underlying ways of conducting the analysis. The explicit way is elaborated.

The phases of thematic analysis

The process of analyzing the data was conducted twice. The first analysis consisted of the data collected through the exploration phase, analyzing the first group interview and the data collected through the workshop. The second analyzing process was conducted during the reflection stage on the data generated from the group interview for obtaining feedback on the prototype. However, the thematic analyzing process was similar for both iterations and were conducted based on the step-by-step guide by Braun and Clarke (2006), consisting

of six phases. Braun and Clarke (2006) emphasizing on the fact that these are guidelines and not rules. These consist of:

1. Familiarize yourself with the data
2. Generate initial codes
3. Search for themes
4. Review themes
5. Define and name themes
6. Produce the report

The first step is getting familiar with the data collected (Braun and Clarke, 2006). Since the researcher collected the data, some initial ideas and themes were obtained during the interviews and workshop. Within the familiarisation of the data is to transcribe the verbal data, and then reading and re-reading it. The transcription of the data was handled manually, which also initiated a deeper dive into the data. Finally, the thoughts were documented and visited during the next phase.

After writing down some initial ideas on the interesting parts of the data, the second phase is to start generating initial codes (Braun and Clarke, 2006). "[C]oded data differs from the units of analysis (your themes) which are (often) broader" (Braun and Clarke, 2006, p. 18). The codes were created in the qualitative data analysis software, NVivo. The list of initial codes was many since almost the whole data set was coded based on what was being said.

After generating codes, the researcher wrote down some of the concepts on post-it notes and tried gathering them to make more general themes. These themes were reviewed several times through new findings in the literature and writing and conducting the other research phases. This also shows that the design process has been conducted iteratively.

The first analysis processes produced themes used during the exploration stage and creation stage, while the second analysis for the reflection stage. The final themes from both processes are displayed in Table 3.4.1, along with the service design thinking stage in which they apply.

Stages of service design thinking	Themes
Exploration	<ul style="list-style-type: none"> • Challenges to current transportation services • Reflections on other transportation services • ICT knowledge • Cultural Aspects • Environmental Aspects
Creation	<ul style="list-style-type: none"> • A service based on sharing rides • Design features to reduce challenges • Features for age-friendly services
Reflection	<ul style="list-style-type: none"> • Design features reflections • Challenges facing the service • Improvements and new functionalities

Table 3.4.1: The final themes found through thematic analysis.

3.5 Research Reflections

This section reflects on the quality of the research. Assessing the quality of the study is based on the underlying research paradigm.

A paradigm is "a pattern or model or shared way of thinking" (Oates, 2006, p. 13). Oates (2006) discuss three paradigms, namely, critical, interpretivism, and positivism, and state that there is an underlying paradigm in all research. The paradigms have various ways of viewing and gaining knowledge of the world (Oates, 2006). Understanding and choosing the "philosophical paradigm" for the research is essential because it helps determine how involved the researcher will be while conducting the study. In this study, the researcher tried to be as little involved as possible and was not "concerned with identifying power relations, conflicts and contradictions" related to the critical paradigm (Oates, 2006, p. 296). Nonetheless, the researcher has a hypothesis that an ICT management service can increase mobility in rural areas and is attempting to interpret the data as objectively as possible. These characteristics correspond with the positivism paradigm.

To reflect on the quality of positivist research is discussing its objectivity,

reliability, internal and external validity.

The objectivity depends on how involved the researcher has been while conducting the research. The aim of the study was that the researcher would be as objective as possible. However, it can sometimes be challenging to analyze qualitative data without having some previous thoughts on the results due to prior knowledge on the topic. Nonetheless, the data was mostly interpreted inductively, which could solve a researcher's bias towards one solution by having the data lead the results. Using a service design process has also been useful for keeping objective as the method is user-centered. Consequently, the researcher tried to make decisions based on what the users have discussed and described during the data generation.

During the analysis, the interviews were coded into what was being said in the specific section before generating themes. This increases the reliability of the research as others would find the same codes by generalizing what was said in the interviews.

Lastly, creating a valid research "means that an appropriate process has been used, the findings do indeed come from the data and they do answer the research question(s)"(Oates, 2006, p. 10). Since the paradigm is positivist, both internal and external validity should be discussed. Internal validity is related to how well the data generated actually leads to the findings. In this research, the findings are interpreted based on the data generated, and the researcher tries to show the readers how conclusions are created and which parts of the data give which results. Direct quotations from the data are used to link the results to the raw data.

External validity is connected to the findings and how they can be related, or generalized, to different people outside the participants included in the research. This is further discussed in chapter 5.

3.6 Ethics

A researcher has several responsibilities to enforce to conduct an ethical research (Oates, 2006, p. 60). There are several examples of ways of behaving as an ethical researcher. Firstly, related to the participants, their level of anonymity should be respected, they should not be forced or feel obliged to participate, and they should give consent. Concerning the research, the data should not be manipulated and tampered with to suit desired results and should not pass someone else's work as your own (Oates, 2006, p. 61). These are some of the

several guidelines this research has aimed to follow.

To make sure data is gathered ethically, the research needs to get approved by the Norwegian Centre for Research Data (NSD) before commencing the data collection further described in the following section.

3.6.1 NSD Approval

NSD helps to ensure data is collected safely. The researcher creates a data management plan consisting of what data will be collected, how and who is participating, and where it can be stored safely. Furthermore, within this plan, creating an information pamphlet to send to the participants concerning the project and their rights. This document describes the purpose of the project, who is conducting the research, and how the data gathered will be used and serves to get informed consent. If the plan meets the requirements, it will get approval from NSD to commence the data gathering. The readers can find the information pamphlet consisting of information about the study, and NSD approval in Appendix A.

3.6.2 Facebook considerations

To conduct the observations on the Facebook group mentioned in subsection 3.3.1, the researcher had to consider the ethics and data safety surrounding the observation. The researcher reached out to NSD for guidance on approaching the issue and responded that as long as no personal data or direct quotations were collected, there was no need to report it to NSD. The group is public, meaning that everyone has access to it, but that does not mean that it is ethical to observe without letting the group members know.

The paper by Franz et al. (2019) describes that it can be wise to first get in touch with the administrators of the group and ask them how the members should be informed as they have insight on their members. The researcher tried reaching out to all the group administrators, but none of them saw the message. At last, the researcher requested to enter the group. Then a post was published explaining the project, how the researcher gained knowledge about the group, and how long the observation would last.

Chapter 4

Results and Prototyping

The following chapter starts by detailing the context of use for the research, namely Folldal. Then the results are presented within the stages of service design thinking mentioned in chapter 3. The steps elaborated in this chapter are exploration, creation, and reflection. The first stage, exploration, describes the findings surrounding transportation services and ICT and explores the context, both culturally and environmentally, for the service. These findings are further used for developing a prototype of an ICT transportation management service in the second stage. Finally, the last step describes the results found through obtaining feedback on the prototype.

4.1 Context of Use: Folldal

The community of Folldal, located in Norway, is the context for this research. It is a municipality in the county Innlandet. The population density is one citizen per km² (Statistisk sentralbyrå, 2021b). 22% of the population is over the age of 65, making it the county with the largest share of older adults (Innlandet fylkeskommune, 2021). The following numbers are taken from Statistisk sentralbyrå (2021b). Folldal has 1518 residents. Numbers from 2020 show how 458 of those are over 65, which make up approximately 30% of the community compared to the approximately 18% in the overall Norwegian population (Statistisk sentralbyrå, 2021a).

Furthermore, the numbers from Statistisk sentralbyrå (2021b) show that a large part of the population in Folldal live alone. Nonetheless, half of the people living alone are over the age of 67 (Statistisk sentralbyrå, 2020).

Moreover, even though the overall county is increasing slowly in the number of residents, the population of Folldal is expected to sink to 1477 by 2030 and by 2050 to 1411 inhabitants. Moreover, in 2020 the net migration was minus

11.

The municipality has, through several projects, tried to improve public transportation, but they have all shown to be costly to operate (Brendryen, 2019). So they have now entered a collaborating for the "Smart Transport in Rural Areas" project, mentioned in subsection 1.1.1, which is a reason for using Folldal as the context for this research.

4.2 Exploration Stage

The themes found during the exploration stage, as described in Table 3.4.1, are detailed below.

4.2.1 Challenges to current transportation services

This section elaborated on the challenges and reflections related to the current transportation services available in Folldal.

Private car

Most of the participants use their cars to get around and enjoy the easiness and flexibility of having a car available. However, they discussed that using the car is an expensive way of traveling. They further mentioned that keeping a vehicle safe and starting even when the outside temperature drops to minus 40 degrees is costly.

Discussing their car use, one participant mentioned, "driving on my own, for the time being"(1.2, Appendix section D.1). Another added, "as long as there is a car. Gets worse when you loose the certificate"(1.1). This shows that the participants are aware that they will eventually lose their driver's certificate and depend on others to get around. They mention that they can and could sometimes get a ride from family members but cannot depend on them. "I have people at home on the farm, but I cannot rely on them to drive me here and there"(1.3). Another mention that family members live far away and a great deal of planning is needed. Therefore, they know that they have to move to the center to keep mobile when they no longer can drive since the area is prioritized regarding transportation. The participant who is no longer driving lives there and can walk to most places nearby.

Public transportation services

However, the participants mentioned several challenges to the existing public transportation. First, the participants describe the public transportation in Follidal as inadequate. Inadequate due to few bus connections in the area, and those that exist, primarily focus on transporting schoolchildren. A participant mention that he lives over four kilometers away from the nearest bus stop. Suppose the participants do travel by public transportation. In that case, they have to switch transportation several times and mention that "bringing the luggage with you can be difficult"(1.4). Researching the bus opportunities in Follidal through the timetables, the researcher confirmed that most public service transportation is related to transporting school children (Innlandstrafikken, 2021). However, locating one bus that travels without school hours and departing once a day during the weekends between the neighboring communities (Innlandstrafikken, a). Nonetheless, the participants mention that one thing is getting transportation to a place. However, the lack of insurance for getting back home keeps them from taking public transportation.

Second, the participants discuss a lack of cooperation between the public transport going through Follidal with other transportation services and community members.

"I am dependent on driving to the bus, and the bus has to correspond with the train. However, he does not guarantee it. Sometimes the bus is late, and the train does not wait. And then the ticket expires."(1.5)

Another participant reflects on their travel needs compared to the available transportation. Mentioning that "the bus often is empty, since they do not go precisely when you are leaving."(1.6) Furthermore, that "it was easier before, a bus went straight to Oslo, so you did not have to switch [bus]. The offer was canceled. Even though the bus went full."(1.7)

Furthermore, the public transportation service offers a taxi that the user can call that drives along the bus route—an alternative to prevent the bus from going empty (Innlandstrafikken, b). A participant highlights that it "only operates the days there is a need, so that is smart."(1.8) On the other hand, the option is not flexible enough to handle the first and last-mile challenge. "It only goes to the center, and those who live further down the countryside have to, in that case, order a taxi privately from here to home."(1.9)

Taxi services

The participants mentioned the use of a regular taxi. For example, the non-driving participant has previously shared a taxi with several others. "It starts with a few people, then they talk to others, and more people join the ride,"(2.8, in Appendix section D.2). Then the taxi drives around, picking them up. Nonetheless, using taxis could overcome the first and last-mile challenge. However, "the taxi fare, over such long distances, that is expensive."(1.10). The participant further mentions that using a taxi to get new glasses, they would have to drive to the neighboring municipality Tynset. "That would be some high priced glasses, they would become twice as expensive"(2.4). This highlights the need to explore other transportation services.

4.2.2 Reflections on other transportation services

The participants mentioned that the community is ready and open for new transportation services since they are very aware of the consequences of not having transportation opportunities. In addition, the volunteer worker mentions that probably more people would participate in social activities if they knew that they could ride along with someone to the activity. The interest in transportation improvements in the community is highlighted through observations from the Facebook group. The researcher published a post to inform the participants about the project and got positive feedback in the form of people liking the post, commenting, and sending personal messages showing the willingness to help. The following section describes reflections, both opportunities and challenges, concerning the services involving ride-sharing, ride-hailing, and autonomous vehicles.

Ride-sharing services

The participants are accustomed to sharing a car amongst neighbors and community members. Firstly, they mention sharing the load by driving alternately to events or with their neighbors. Moreover, a participant mention that he sometimes calls others that he knows cannot drive anymore and lacks other transportation methods and offers to share a ride. "That is probably what we are good at in the districts. But, we could probably be even better"(1.11). Because, as mentioned, "it is that concerning availability"(1.15), that there should be more available ride-sharing times to choose from. As further described, the opportunity lies in being able to announce it. For this purpose, a participant

mentioned having a specific group with the possibility of announcing, "I need a ride, and I am going out to drive"(2.4). Further stating that he has thought about creating this group,

"Where they enter their needs with both the time and places they are going. And likewise, those who are going somewhere can enter when they are driving and where they are going."(2.5)

However, in the rural area, Kvikne in Tynset, they tried implementing a ride-sharing service on their own. The bus connection to Tynset from Kvikne is limited, so they were optimistic that the community would benefit from an opportunity to share rides (Tynsetingen, 2018). Through an email, located in Appendix B, a Kvikne resident mentioned that a ride-sharing guestbook was added to their website and appeared by clicking on a small bus icon. However, it did not become a success as people offering rides did not get any response. Consequently, they removed the opportunity when they moved the website to another platform. This example shows that creating and implementing a ride-sharing service on their own can be challenging.

Ride-hailing services

The researcher explained the concept of ride-hailing services to the participants. However, they were quick to mention that they were not accustomed to this type of service. Further emphasizing the ride-hailing challenge of having an unknown driver, that "A total stranger from a totally different place, then maybe I would be a little skeptical"(1.12). Furthermore, they mentioned that there are not many people driving by Folldal sporadically, which is a challenge for dynamic ride-sharing.

Autonomous vehicle services

Further, the theme of autonomous vehicles was brought up. The participant had divided thoughts about this possible service. One of the older adults humorously said, "I personally would like a driver on it"(2.1). Moreover, another older adult mentioned that "it sounds so scary"(2.2). The volunteer worker agreed that it sounded scary but described the possibilities with this type of service, which the older adults agreed on. She discussed that the technology could avoid traffic incidents and ease the challenge of having drivers that need to rest between trips due to the long distances. Highlighting the opportunity

by stating, "I do not think we would be sad, if one or more of these cars came to Folldal to drive us around"(2.3). However, Hedmark Trafikk (2018) mention that they attempted to implement autonomous vehicles in three different towns in the same county as Folldal. However, the service was shut down due to high cost, and immature technology, amongst others. Nevertheless, autonomous vehicles will be able to solve parts of challenges regarding people transportation in these areas (Hedmark Trafikk, 2018, p. 12). Regardless of the transportation service implemented, an ICT front-end will eventually be created to manage and organize the transportation. Therefore, exploring the knowledge and skills of older adults regarding ICT is essential.

4.2.3 ICT knowledge

The older adults used smartphones but switch over to a tablet if the font size got too small or too complicated. A participant mention that she "use the tablet a lot. For online banking, among other things."(1.14) During the interviews, the participants mention several ways they are handling and employing ICT tools. Investigating their digital skill and the tools and features they are familiar with is necessary to create a user-friendly service. The workshop showed that the participants use and are familiar with many digital platforms, such as Snapchat, Facebook, Instagram, Vy, and Teams. However, the one they use the most seems to be Facebook. On the platform, they primarily use groups and the chat function.

An opportunity lies in the apparent use of Facebook groups. The volunteer worker mention that they have specific birthday carpool groups. "There are 17 students in the class, but we don't need 17 cars to transport 17 kids. Just a couple of cars will do"(2.6). Furthermore, the Facebook group involving community members has already been used to ask for services involving driving on several occasions.

As a way of staying connected, the participants describe creating groups with their families both as a Facebook group or on Snapchat. They mention that they like using groups on Facebook because it is easier to find back to posts, and they have more in common and trust more of the people in the group. Moreover, a participant mentioned they had to click on it right away to see a post on Facebook. Otherwise, they would lose it because they did not remember who posted it. Some participants mention that they use Snapchat and know how to use the map function, both seeing others, and 'hiding' and 'showing' themselves on the map. They also liked the map function at Vy because they can check that the correct pick-up and delivery address is typed in.

However, they sometimes need help from the younger generation to learn and install new applications or get help with the current platforms. Some also get some help from other family members at home.

4.2.4 Cultural Aspects

During the interviews, the participants mentioned several aspects of living in their rural community.

The participants mention how they are cooperating and like helping each other in the community. Within the community, they seem to trust each other as they mention they would ride along with any community member. There is also a culture of sharing. As previously stated, the participants mentioned that they are sharing rides. They call and ask if other community members that are not able to drive needs a lift. Not only are they sharing rides, but they are also sharing digital findings and information amongst each other. Furthermore, they mention that they usually have a rich social culture, especially among the older adults who like to be social. However, saying that, a lot has changed after the pandemic came along.

Another aspect discussed was that if they start driving around and act as taxis, the taxi drivers in the area would become jobless. The participants clearly stated that they did not want to take the job from another community member.

4.2.5 Environmental Aspects

The participants mentioned several aspects of living in a rural environment. An advantage to the rural environment is that they are used to planning since a trip to the nearest store takes time. However, there are several disadvantages. One of the negative aspects of living in a small and rural community is that the distances are long as there is on average one resident per km² (Statistisk sentralbyrå, 2021b). The distances make them highly dependent on driving if they do not live in the center. They say the center is prioritized, especially in terms of transportation, which is why people have to move there when they no longer can drive.

These large distances are challenges for both ride-hailing services and taxis. As previously mentioned, "it is the driving and rest-time for these drivers that are problematic in the districts due to the distances one has to drive during a day"(2.7). In addition, since the community's location is in-between two main

roads, it is challenging to use drivers from other areas except for community members.

Moreover, the weather conditions can make it difficult for public transport, and expensive to maintain a car. "There are some buses corresponding if the driving conditions allows it, and the bus driver dares to drive"(1.13).

The new gained knowledge from this exploratory step is used further in the creation stage.

4.3 The Creation Stage

The creation stage consists of creating the prototype based on the knowledge gain from the exploration stage. The sections are divided by the themes in Table 3.4.1. The following section starts by describing the overall concept of the ICT management transportation service. Then, further on, it describes design features that are implemented in the prototype. These features are based on the knowledge from the exploration stage and the challenges and possible features mentioned in chapter 2, and summarized in Table 2.6. For every design feature, a figure to show how they are implemented in the prototype is illustrated. For the purpose of the report, the figures were translated into English.

4.3.1 A service based on ride-sharing

First, the transportation service that, both through generated data and previous knowledge, can have potential in this area is ride-sharing service. The findings suggest they are used to sharing rides. However, they have trouble announcing it and organizing it to create more available ride-sharing opportunities. The prototype is therefore created as an ICT transportation management service for primarily ride-sharing. However, the service has also integrated ideas from dynamic ride-sharing and the potential surrounding autonomous vehicles. The service can also help pick up packages and other related helpful services. The idea behind these possibilities is to reduce unnecessary driving and help those who cannot drive with small services that usually would require a car.

However, it must be easy to use and understand for older adults for a service to be utilized. The design workshop provided insight into their ICT use. Firstly, it showed that they used smartphones but used the tablet for complex tasks, such as online banking. Therefore, the prototype is created for use on a tablet.

Secondly, the findings showed that they are familiar with Facebook, Snapchat, and traveling applications such as Vy and Entur. Therefore, the ICT prototype tried to implement designs from these platforms for familiarity.

Furthermore, before creating the ride-sharing service, the researcher explored solutions to the challenges related to ride-sharing. As mentioned in chapter 2, older adults in previous research have faced several challenges related to sharing a ride. The following features are created based on the data from the interviews to ease the challenges mentioned in the literature. The following illustration, Figure 4.3.1 shows the start page after pressing 'Register a trip'. This start page is based on the participant mentioning a ride-sharing program should announce, "I need a ride, and I am going out to drive"(2.4).

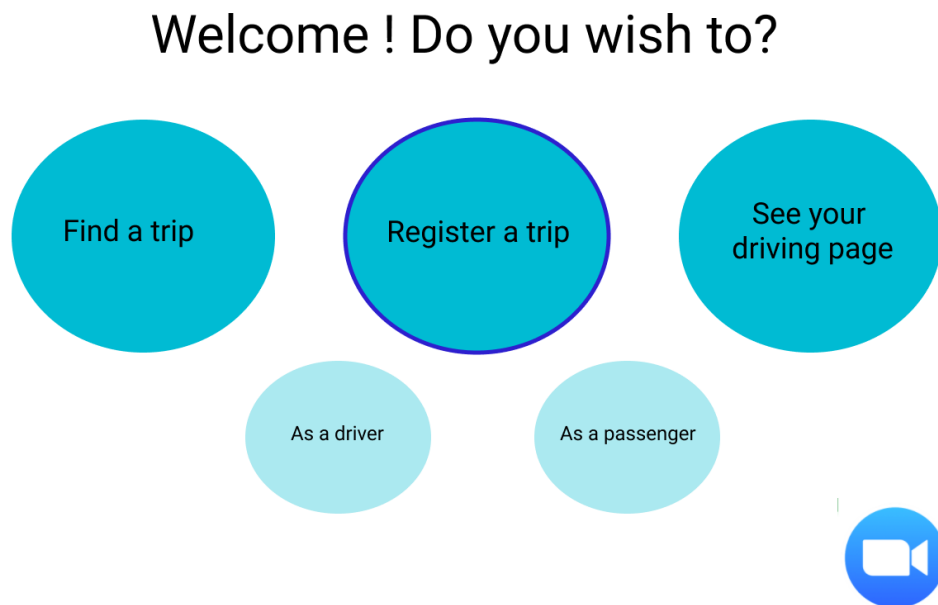


Figure 4.3.1: The start page of the prototype.

4.3.2 Design features to reduce challenges

Group based ride-sharing

The feature of basing ride-sharing on groups tackles both the challenge of trust and reliability and of having a limited network. As mentioned in the findings in subsection 4.2.2 and subsection 4.2.3, they are accustomed to using groups,

both to socialize and also for transportation. Furthermore, basing the service on groups is to give the possibility to choose depending on the users' level of comfort with the service they are asking for or giving. This idea further builds upon the idea of by both Heinz and Kelly (2015) and Payyanadan and Lee (2018), sharing rides with friends and family of their friends and family to expand the social network.

The groups in the prototype are the Facebook group, *'Du vet du er Folldøl når:'*, 'You know you are from Folldal when:', an imaginary group for the people engaged at the volunteer center, "Your friends and your friends' friends," "Your friends," and the possibility to create customized groups. These are illustrated in Figure 4.3.2.

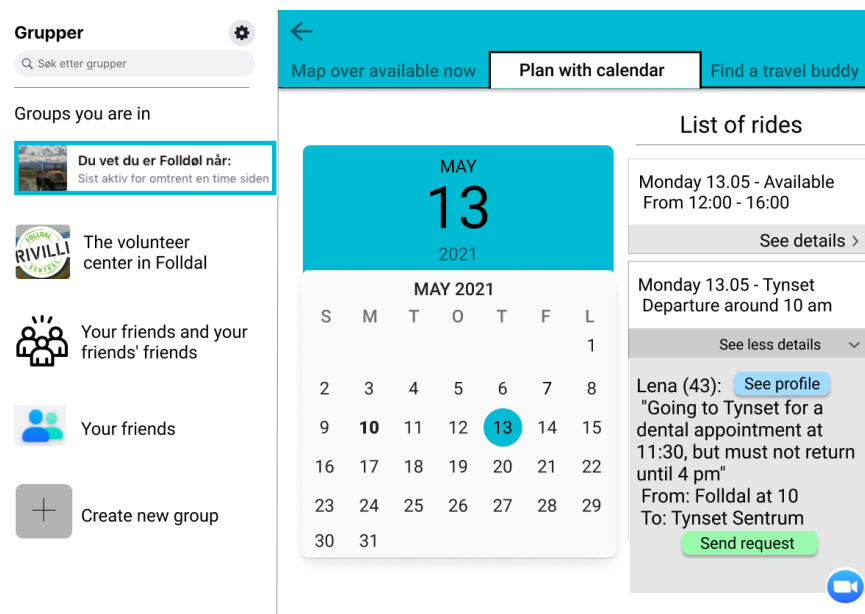


Figure 4.3.2: The groups as displayed on the left side of the figure.

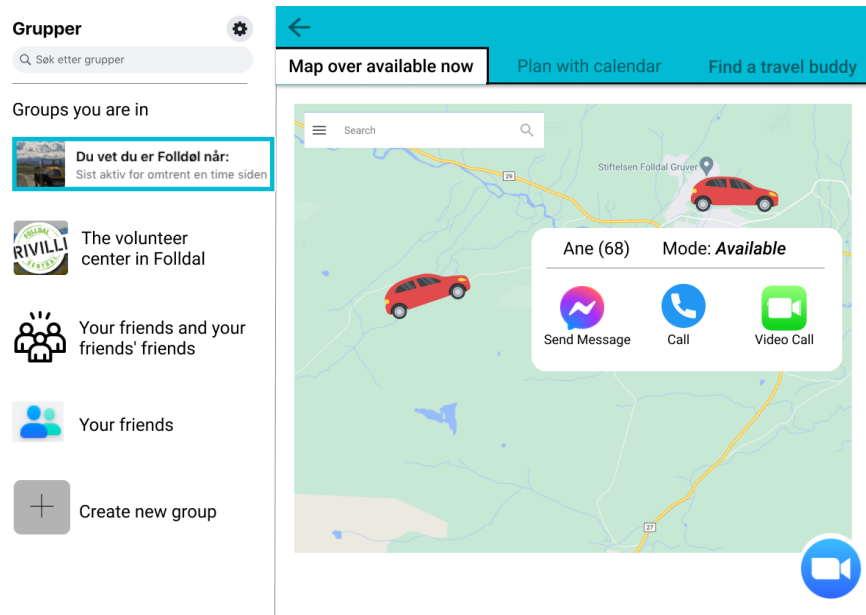
Availability Map

The availability map feature to procure a ride without having to order in advance is related to one of the advantages of ride-hailing services. The advantage of ride-hailing is that the user does not need to plan for a trip long in advance but can travel spontaneously. TNC services such as Uber use a map for the users to see where the driver is located. The previous ideas, along with the participants mentioning the Snapchat map, in subsection 4.2.3, generated the idea that users can see others users that have declared themselves as 'available' on a map.

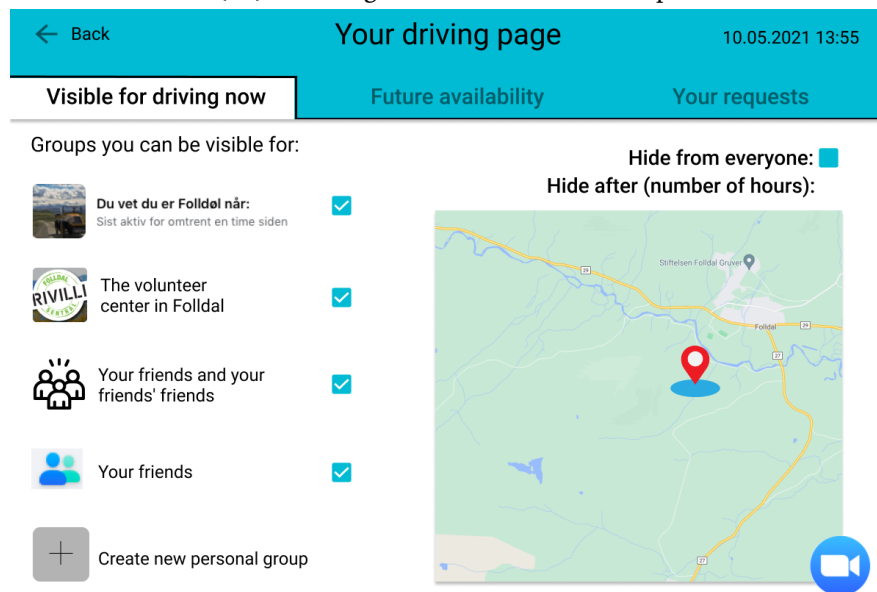
Furthermore, the users can choose to be available only for specific groups or be unavailable for everyone, as with the Snapchat feature. The map over availabilities and choosing to "show" or "hide" from the map handles several challenges related to transportation services:

- The challenge of feeling like an inconvenience or accepting a ride since the user knows that the driver has specified that he or she is available. Also, the user sees if someone is already driving, is at home, or somewhere near the center.
- Privacy concerns, by hiding from the map or choosing to be available only for a group of people.
- Increasing flexibility by having the opportunity to ride or ask a favor without planning long in advance.

The map functionality is shown for passengers in Figure 3a, and for drivers in Figure 3b.



(3a) Showing users available on a map.



(3b) Feature of "showing" and "hiding".

Figure 4.3.3: Using a map to show availability.

Planning availability

However, planning is essential for some users, so having the opportunity to handle the same challenges as mentioned above, but with the planning ability, is necessary. Since, as Davey (2007) mention, the older adults did not want to ask for a ride unless they knew the person they are asking is flexible. With this feature, the passenger can know that the person is available during a specific time-frame and ask for a lift or a service, as illustrated in Figure 4.3.4.

The screenshot shows a mobile application interface titled "Your driving page" with a teal header. The header includes a back arrow, the title, and the date/time "10.05.2021 13:55". Below the header are three tabs: "Visible for driving now", "Future availability" (which is active), and "Your requests".


The main content area is titled "When are you available?". It features a calendar for "MAY 2021" with days of the week (S, M, T, W, T, F, S) and dates (1-31). The date "13" is selected and highlighted in a blue circle. To the right of the calendar, there are input fields for "From:" (08:00) and "Until:" (22:00). Below these is an "All day:" checkbox, which is currently unchecked. At the bottom of this section are "Back" and "Next" buttons.

To the right of the calendar is a section titled "My times:". It displays a selected time slot: "Monday 16.05" and "From 12:00 - 16:00". Below this is a "See details >" button. At the bottom right of the screen is a blue circular icon with a white video camera symbol.


Figure 4.3.4: Adding future available time-frames.

Ordering a round trip

The participants mentioned, as in subsection 4.2.1, the importance of not only being able to travel one way but having the security of getting back home. In addition, offering round trips is mentioned as a possible feature in chapter 2, as a way to ease planning and scheduling. Therefore, using an interface similar to the transportation planning platform Vy, the prototype made it possible for the users to plan for a round tour, illustrated in Figure 4.3.5.


← Back A  A

Hi, where do you want to travel?

Where are you traveling from?  Where are you traveling to?

Dato 11. mai	Tid 10:00	Latest arrival 11:30
-----------------	--------------	-------------------------

When and where do you want to return?

Where are you traveling from?  Where are you traveling to?

Dato 13. mai	Tid 18:00	Latest arrival 19:00
-----------------	--------------	-------------------------

Add driver information:




Figure 4.3.5: Ordering a round trip.

Using the youth as an available source

As mentioned in subsection 4.2.3, the older adult often turns to the younger generation for solving ICT problems. This shows that the younger generation can be a resourceful source that could help older adults when they need digital assistance. Therefore, this feature attempt to combine this opportunity with the feature mentioned by Bühler et al. (2014) of having individual human assistance while traveling. This feature could help ease the technology challenge, as they can get help directly if they get stuck. The idea would be that the younger generation gets compensated with points for being beneficial for the older adults. These points can be further used on a ride which means that both parties would benefit from such a feature, undertaking the challenge of reciprocity. The feature is found by pressing the blue video chat button, which leads the users to the illustration in Figure 4.3.6.

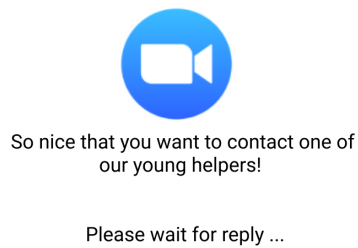


Figure 4.3.6: Video chatting for ICT assistance.

Personal profile

A feature based on ride-hailing services is having a driver profile in order to ease the reliability concerns. The profile shows their residential area, age, how the user and the profile are related, along with a photo. An example profile was made for the prototype as seen in Figure 4.3.7.

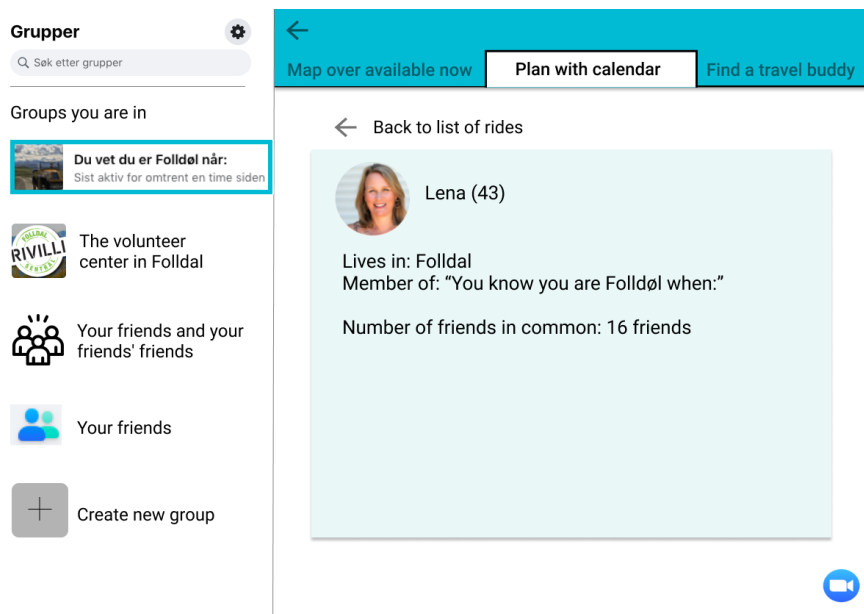


Figure 4.3.7: The profile of a user.

Sharing fuel - giving something back

Reciprocity is a challenge mentioned both by the participants and in previous literature. As mentioned in chapter 2, providing money for fuel could be a way not to feel indebted to the person driving. The participants also mentioned that "it can be nice to share fuel. Especially for the people that do not drive on their own, as they do not have the fixed expense of owning a car"(1.16). Another participant added, "So, they cannot return the favor"(1.17). The researcher implemented the possibility of accepting a small payment for having to drive a detour for the ride, as money could be an incentive (Payyanadan and Lee, 2018). The feature is illustrated in Figure 4.3.8.

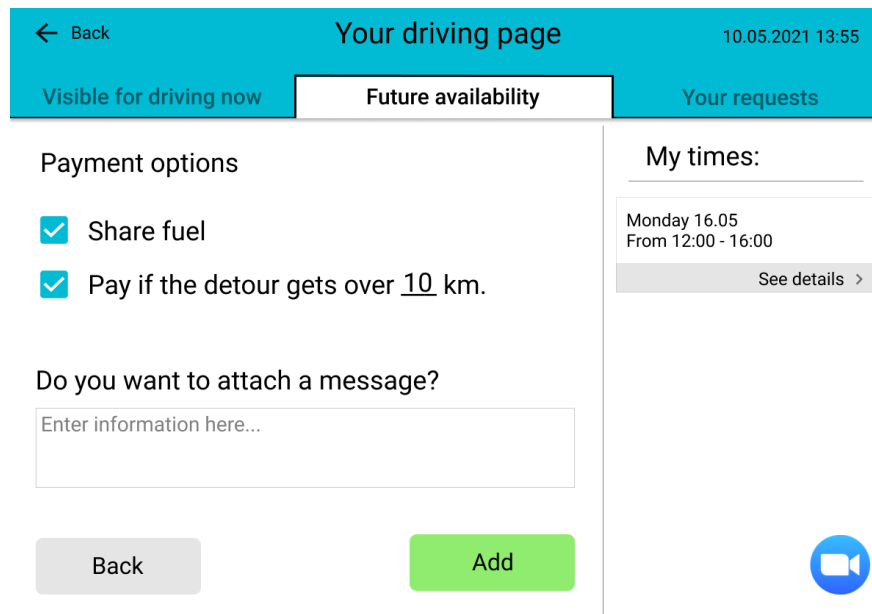


Figure 4.3.8: The payment possibilities.

Taking a trip using an autonomous car

The results suggest that there lies an opportunity for using autonomous vehicles, even though they are skeptical, as mentioned in subsection 4.2.2. Furthermore, learning about the technology was mentioned as a opportunity in section 2.4 to ease the concerns regarding the technology. Therefore, the researcher added, as seen in the third option in Figure 4.3.9, the feature of choosing between a trip using a private car or an autonomous vehicle. The former being much more expensive than the latter since the low cost could be a motive. Furthermore, the feature is implemented with a 'Learn More' button for

the participants to learn more about the technology to potentially accept the ride. Taking a trip using an autonomous car could solve several concerns, such as asking for a ride, the feeling of being an inconvenience, and lack of flexibility.

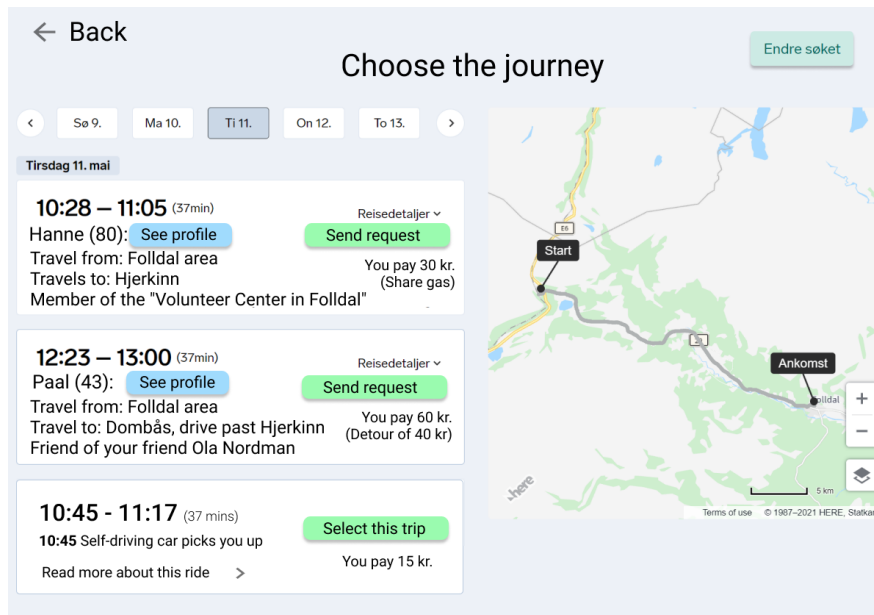


Figure 4.3.9: The trip using an autonomous car is illustrated in the third option.

Combining socializing with transport

The literature review conducted revealed that a feature the older adults would like in the study by Vargas-Acosta et al. (2019) was to be able to use the transport platform combined with a way of socializing with others. The observation conducted on the Facebook group showed that older adults were very active in sharing stories or old photos and also commenting on each other's posts. Since the data collected show that they seem to be active on Facebook to socialize with others in the community, this could enhance mobility and create more transportation opportunities.

Adding transportation possibilities on a socialization platform could, amongst others, facilitate attending events. This is shown in Figure 4.3.10. The user can either attend as a passenger needing a ride or as someone driving to the event. This idea can facilitate asking and reducing the feeling of being an inconvenience since the driver is going to the place at the same time (Davey, 2007). It can also ease concerns regarding planning and scheduling as it is handled by the system and of having a limited network.

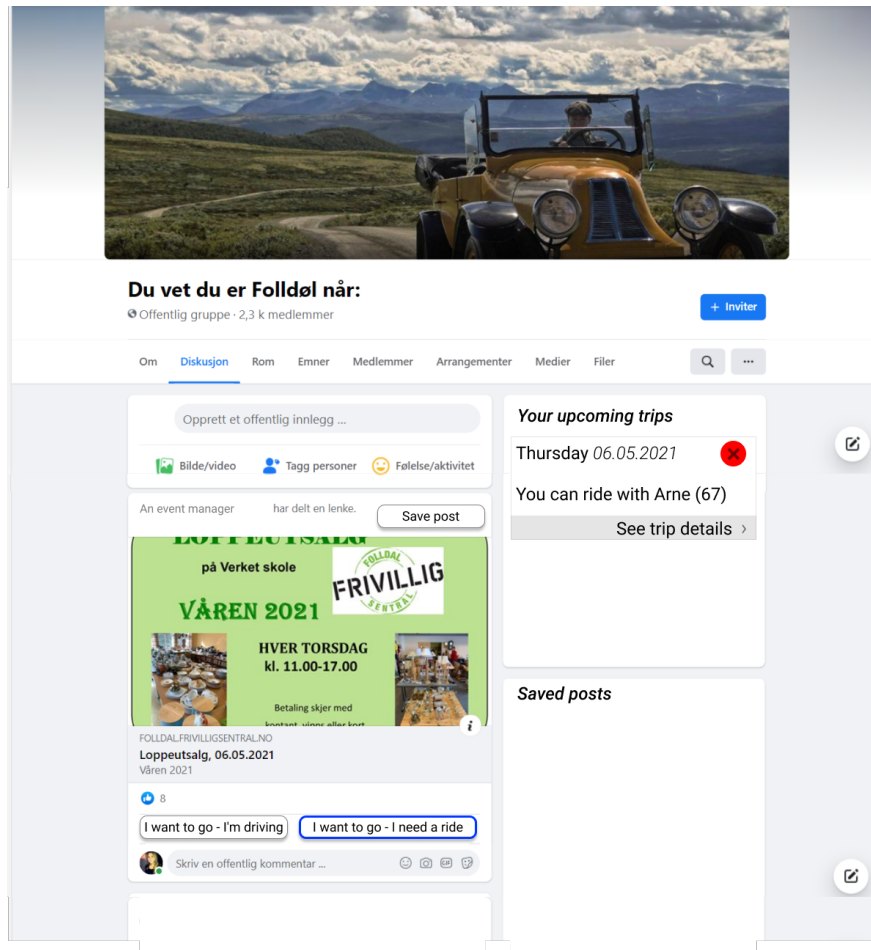


Figure 4.3.10: Getting a ride to an event.

4.3.3 Features for age-friendly services

The section 2.5, mention several features for designing an age-friendly service. These are tried incorporated into the prototype, such as having few icons, creating a platform based on familiarity, and adjusting and choosing according to the users' needs as these features can improve communication and technology concerns.

Furthermore, the ability to change font size, depending on how large the user would like it, as shown in figure Figure 4.3.11 was implemented. And furthermore, having to choose the purpose for visiting the ICT manager at the start page help customize the interface to show only the functionalities that are relevant to the user. These two previous features are related to adjusting and creating a flexible tool since older adults have different ICT knowledge as

mentioned in section 2.5. Another relevant feature is the user choosing how they wish to communicate, either by message, phone, or video chat, to communicate the trip details and their needs more efficiently depending on the users ICT skills. This last feature is shown in Figure 4.3.12.

(11a) Before adjusting the font size.

(11b) After the adjustment.

Figure 4.3.11: The ability to change the font size.

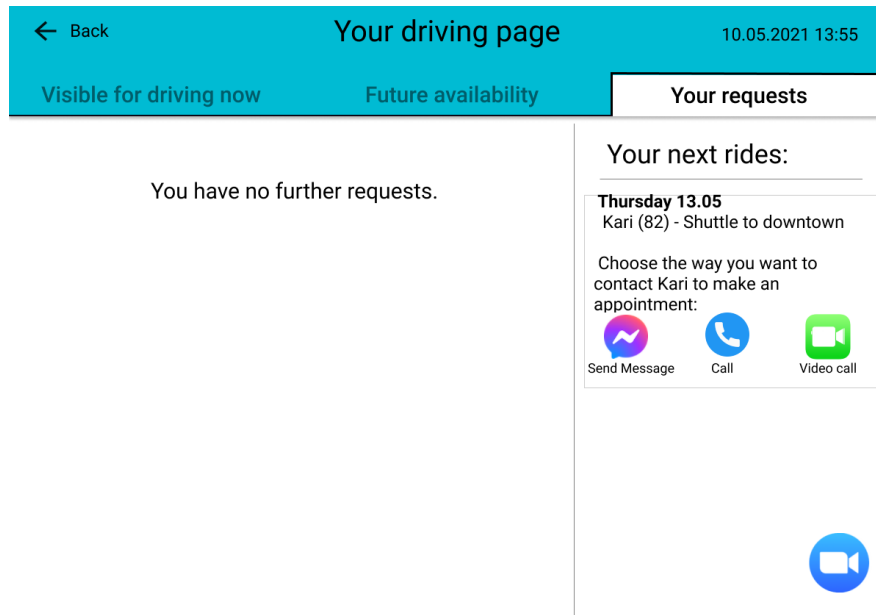


Figure 4.3.12: The various ways of communicating.

4.3.4 Summary of features related to challenges

A summary of the design features and which challenge attempt to handle is shown in Table 4.3.4.

Features	Trust & Reliability	Limited Network	Privacy	Inconvenience	Reciprocity	Asking	Planning & Scheduling	Flexibility	Communication	Technology
Groups	X	X								
Availability Map			X	X		X		X		
Planning Availability				X		X	X			
Round Trip							X			
Youth help										X
Profile	X									
Share Fuel				X	X					
Autonomous Vehicles				X		X		X		
Social & Transport		X		X		X	X			
Age-friendly									X	X

Table 4.3.1: A summary table connecting design features to challenges.

4.4 Reflection Stage

The following section describes the results from assessing the service prototype through a group interview with the participants. The following part describes the feedback on the design features created to tackle transportation service challenges.

4.4.1 Reflections and feedback

The feedback on the design features was positive. The participants seemed to see the potential and the opportunities that come along with the service. When asked about possible disadvantages, the answer was "No, I see only opportunities." (3.12, in Appendix section D.3) Nonetheless, some features did seem to

appeal more than others, such as having a group-based service, the features surrounding the availability and sharing the cost of fuel, and also the opportunities concerning the idea of combining socialization with transportation and several of the added design features, compared to using and learning about autonomous vehicles. The feedback and reflection on these features are elaborated on below.

Groups

A participant described how the group feature might be used. She mentions that depending on the day, one might want to be selective about whom they want to share a ride with, "So it can probably be nice to be able to choose how large a circle of friends you will reach"(3.13). The participants feel it safer with 'friends of friends' through the scenarios but discuss that they probably would get a better chance of someone accepting the offer if they posted in the large Facebook group. For the group involving the friends and the friends of your friends, they mention, "If we get someone that knows that person that we know, and we get some information about the one driving. Then it is probably not that risky"(3.14). "Also, it is a small place, so the probability that it is someone we know, can be quite big"(3.15). Nonetheless, another mentioned creating "The 'Smart Transport Folldal'-group"(3.16), showing that they understand and would further build upon the feature.

Availability

The participants enjoyed the ability to see the others that are available. Mentioning, "we know that there are many driving"(3.5), "But we have no idea where the passing traffic is headed"(3.6), which shows the opportunity surrounding the feature. Furthermore, the participant highlights how driver availability can ease the feeling of being an inconvenience "because then the persons imply that 'Yes, you can ask me both this and that since I am driving around here anyway'"(3.7). Further mentioning that,

"We can know that the neighbor is driving, but you do not bother asking anyway, since you do not know if it works for them"(3.17)

Sharing the cost of fuel

The participants were positive about sharing the cost of fuel. Further, they mentioned that "this has to be a win-win system"(3.18), where the platform's objective is not to gain money but to help each other. However, while still not losing money. Another essential part the participant mentioned is that the system should split the payment for them to make sure the splitting is fair. This to avoid the challenge surrounding the cost, as the participants did not want to pay nor too much nor too little.

Combining socialization with transportation

A participant mention that they all want to do things on their own. So being able to book and get to an event on their own can lower the threshold for going out. The system set up the ride through the social platform rather than having to call for someone to set it up, making them feel like less of an inconvenience.

The volunteer worker saw many possibilities with the feature of combining transportation with events and socialization as she could be able to post events and trust that the system would manage and organize the rides for the participants to get there. She further mentioned that the older adults would feel less of a burden if they could get a ride through the application rather than having to call her and ask her to set up a ride. Further describing that "a small keystroke here can make them get more involved and getting out."(3.19)

Multiple ways of communicating

Initially, the idea was that having several ways of getting in touch with the driver could reflect that older adults are a spectrum having various needs. Since some might enjoy seeing the person they are dealing with for the sake of familiarity, while others would want to send a quick message. However, this idea resonated for several reasons.

The participants enjoyed that they had several ways of getting in touch. In one of the scenarios, they mention that calling would be the better fit, "Nice to call, then you can get hold of the person right away"(3.20). Further mentioning that calling has its advantages, "You have had a proper conversation. They will not just drive past because you have an agreement. An agreement you have talked about"(3.22). Another participant highlights calling with video as well, "Would have been best to call. Calling with a video, then you can see them

as well"(3.31). In another scenario, they all agreed that they would send a message as "it is done quickly and easily. Nothing you have overheard."(3.21)

Lastly, a participant mentioned that the feature of choosing how to get in contact also depends on the person one is contacting. Not knowing the person, sending a message is more comfortable than calling.

Font-adjustments

The participants appreciated and enjoyed the ability to increase the font size. After adjusting the size and asked if it was readable, a participant answered, "Yes, much better!"(3.9). Another mentioning that they "no later than this morning"(3.10) had come across a text that they would have liked to expand to make it more readable.

Autonomous vehicles

The researcher added both the possibility of learning more about the technology and having the ride with the autonomous vehicle be less expensive than sharing a ride. Nonetheless, the feedback was mediocre. Firstly, mentioning that "It sounds a bit scary not having a driver"(3.27). Secondly, they had no feedback on the learning feature, not knowing what to think about it.

4.4.2 Challenges facing the service

The concern of not receiving responses

The participants emphasize that in order for the service to be successful, it must be used. This means that they need to get responses when offering or asking for a ride or a service. Not getting a response could seem to be a substantial challenge the service needs to apprehend. For example, in Kvikne, when they tried creating a ride-sharing program on their own, one of the main issues was not getting any response on the published rides, see Appendix B. This could seem to be an underlying challenge for the participants in this study as well, mentioning that they would use the service "If one experiences that they are getting help and are able to offer help, and the experience is positive"(3.24). Another participant was asked if she could envision replacing her car with this service and answered, "Yes, I probably could. I would at least have tried it and

see if there was any response"(3.23). Nonetheless, during the observation of the Facebook group, there was evidence that when someone asked for a service, a member was quick to answer and help out.

Establishing a reputation

Throughout the group interview, the participants mentioned that the service would have to be tested and obtain a reputation before considering using it. Highlighted by the participant describing, "It would have to be tried out first, I think, before it is used"(3.25). Concerning using autonomous vehicles, it was mentioned that they "Have to make sure that someone else has used it before and that it has gone well then"(3.26).

Unfamiliarity

The challenge of unfamiliarity, or not being used to a service, was also prominent. First, mentioned with regards to using autonomous vehicles, "we are not used to self-driving cars"(3.28). Secondly, concerning the possibility of getting help from the younger generation through video call. They mentioned that it was unfamiliar to them and also showed concerns about the help they would be able to get. However, on the other hand, they did mention that it would be better than having to chat with a robot or try to formulate a question for the customer service to understand what you are struggling with. This means that they can see the possibilities and opportunities in the feature regardless of unfamiliarity.

The process of readjusting

The participants mentioned a further essential challenge to using a new transportation service and managing the service using ICT. Namely, the readjustment process. They mention that they have had the opportunity to share a ride several times. However, since they are not used to planning and communicating before driving, they often forget. "We throw ourselves in the car and many time we end up at an event and 'oh, there is that guy, and there is the neighbor'"(3.29). The same participant further mentioned that they get in the car without thinking that others nearby might attend the same event, and "then the neighbor drives to pick up his kid, and then you drive to pick up your kid, and then you think afterwards that it is silly to drive one after the other for the same errand."(3.30)

4.4.3 Improvements and new functionalities

Some improvements or comments regarding the functionalities were mentioned throughout the interview. These are listed below.

- The user should be removed from the availability map when accepting a ride
- Adding preferences, such as allowing animals, on the driver profile
- Both the driver and the passenger can contact each other to communicate the details
- Having the opportunity to go back and see the inquiry and what the user answered
- Having the users see that someone is interested in a ride to an event

4.4.4 Summary

A summary describing what they enjoyed about the design feature along with the concerns can be found in Table 4.4.4.

Feature	Positive feedback	Concerns
Groups	Being able to select depending on the day	
Availability	Knowing that they probably would get a positive answer when asking	Being seen on the map
Sharing Fuel	Not having to decide the price on their own	
Social & Transport	Booking an event and getting there without being a burden	
Age-friendly	Font size: Readable text enlarging the font size. Multiple ways of communicating: Flexibility depending on the task, and whom you are communicating with	
Autonomous Vehicles		Not having a driver
Youth help	Not having to explain the problem to a robot or listen to long telephone menus	Unfamiliar How helpful the youth can be

Table 4.4.1: A summary of the feedback from the group interview.

4.4.5 Limitation to the prototype and prototyping process

A first limitation is that the prototype was not fully interactive at the moment of the group interview. Since the prototype is an early draft and not all the buttons are working, the testing of the prototype was conducted with the researcher having a clear plan for which buttons to press in which order. The most optimal way would have been to give the participants the possibility of clicking around by themselves. Another benefit would have been to observe how they moved around the service. A possible way would have been to install cameras behind

them. However, due to the lack of resources and time, this was not conducted in this research.

Another limitation is that an aspect of the prototype did not get feedback due to time constraints. The feature, 'Find a travel buddy', was a concept for sharing a taxi or ordering a bus with someone. A possible good option if there were no available ride-sharing possibilities.

A final limitation is the lack of negative feedback, which could be because the prototype was not fully interactive. Nonetheless, ways of engaging more conversation surrounding the negative aspects should have been explored.

Chapter 5

Discussions

This chapter starts by restating the research questions and recapping the research that has been conducted. Then the first section discusses some of the main findings, followed by a discussion surrounding the final stage of service design thinking, namely, the implementation stage, then by describing implications this research can have for practice. The last section will present limitations to this study and areas for future work.

The objective of this master thesis was to explore what kind of resources and opportunities can be exploited for creating an ICT transportation management service that could facilitate mobility for non-driving older adults. To obtain the objective, the research questions the researcher has answered through the study are as follows:

1. What transportation services can be implemented in rural areas to increase mobility for non-driving older adults?
 - What are the challenges and opportunities related to transportation services in rural areas?
2. What design features should an ICT front-end to a transportation services have to be used by older adults in rural areas?
 - What ICT platforms are older adults familiar with?
 - What features can help solve the challenges related to transportation services?

The three first steps of a service design thinking process were conducted along with participants living in rural areas to answer these questions. First, the exploratory stage was used to understand the challenges related to current and other possible transportation services and design opportunities related to ICT, both through a focus group interview and a co-design workshop. The results

from the interview gave significant insight into the transportation issue for non-driving older adults in Folldal. Furthermore, the combined results from the focus group interview and the design workshop show that there is an opportunity for an ICT transportation management service that is based on sharing rides between community members in Folldal. Second, this newly gained knowledge was used along with previous knowledge from the literature to find design features that could ease transportation services' concerns. Finally, the features were implemented in a prototype that was assessed along with the participants.

5.1 Main Findings

5.1.1 The need for an added transportation service

The results show that the primary mode of travel for the rural older adults in Folldal is by car, which is consistent with previous studies on rural older adults such as Choi et al. (2019). However, driving and maintaining a car is costly, Statens Vegvesen (2019) mention the traffic risk they expose themselves to and expose to others by driving when they no longer should (Choi et al., 2019). Depending solely on their car, the older adults are aware that they become vulnerable when they no longer can drive. When driving cessation comes along, they see no other option than moving to the center or out of the districts from a community with a decreasing population (Statistisk sentralbyrå, 2021b). Implementing this ICT transportation management service in rural areas and having a community that actively uses it could ease the transitioning to a non-driving life. Starting to use this system while they still can drive may have them slowly ease into driving cessation. Furthermore, having an added transportation service provides them with an alternative to using their car, and they can get familiarized with the system before the driving stops. This shows the need for an added transportation service in these areas.

5.1.2 The importance of culture

Trust and reliability has been mentioned as previous challenges in Choi et al. (2019), and Payyanadan and Lee (2018), and were addressed in this study. The participants were skeptical about relying on unknown drivers. However, the results showed that Folldal is a community based on trust, as the participants mention they would be comfortable sharing a ride with any community member. These findings highlight what Payyanadan and Lee (2018) also dis-

covered, that "[o]lder adults in rural settings were more willing to offer and take rides from others in their community even when they were not a family member or part of their social circle"(Payyanadan and Lee, 2018, p. 159). This cultural factor can imply that it could be easier to successfully implement a service consisting of sharing rides in rural areas such as Folldal rather than other communities where trust is not necessarily a primary community characteristic. Such as in urban areas (Payyanadan and Lee, 2018).

Moreover, the findings suggest the community culture is also cooperative, helpful, and sharing. They mention they already try to drive with their neighbors and look out for the ones at risk of isolation due to car cessation, similar to the findings in Choi et al. (2019). These community characteristics can be a reason for the participant to want a 'win-win' system rather than a system based on money as an incentive as Payyanadan and Lee (2018) mentioned could play an important role. Nonetheless, this research confirmed that reciprocity in the form of sharing the cost of fuel, is essential for both the drivers and the passengers. However, that the price should be fairly divided by the service. Nor does the driver or the passenger want more than the actual trip cost, at risk of creating any hard feelings by asking or providing too little or too much. These are cultural attributes that had to be investigated to comprehend to create the service. Furthermore it confirms the opportunities mentioned by Yamamoto and Zhang (2017) and Payyanadan and Lee (2018) of investigating the culture in order to create a successful service.

5.1.3 Group-based service

The prototype by Heinz and Kelly (2015) and Payyanadan and Lee (2018) expand the network for rides by allowing the older adults to connect with the family and friends of their family and friends. The prototype in this study implemented this idea but further building upon it by adding different types of groups and letting the users create their own. The positive feedback towards this feature showed that there lies an opportunity for group-based ride-sharing. Furthermore, the feature can also handle privacy concerns, such as not desiring to announce medical appointments to everyone (Yamamoto and Zhang, 2017). Since, as mentioned by Payyanadan and Lee (2018), the users get the possibility of selecting whom to offer or ask for a ride by posting the request or the ride offer in a group with only friends and family or even create a small personalized group.

5.1.4 The ICT use of Norwegian adults

Heinz and Kelly (2015) mention that one of the primary barriers to using an ICT managing service is "that participants' computer use was moderate to non-existent" (Heinz and Kelly, 2015, p. 44). Further stated by Choi et al. (2019) that none of the older adults participating in the research used smartphones. However, in this study, the older adults seemed accustomed to ICT platforms and were using them daily. The participants used both smartphones and tablets to navigate the internet and stay connected. This could correlate with, as both Vroman et al. (2015) and Slette-meås et al. (2018) describe, that the ICT use amongst older adults is increasing. As 67% of the Norwegian older adults (aged 61-100) used smartphones in 2018, an increase from 37% in 2014 in the report by Slette-meås et al. (2018), this number can have seemed to have further increased in 2021.

Another crucial part is that other community members also should use ICT since the service is based on the community organizing rides by themselves through the ICT managing service. Choi et al. (2019) mention that the middle-aged participants were not interested in using ICT to manage transportation. However, the participants in this study, both middle-aged and older adults, already used ICT to manage their transportation through the transportation planners Vy and Entur. Nonetheless, with the findings and the report by Slette-meås et al. (2018), it could seem to confirm what the statistics by Statistisk sentralbyrå (2017) mention, that Norway is one of the leading countries in Europe with regards to digital skills. Statistisk sentralbyrå (2017) further mention that having a community that is used to practicing ICT is essential for utilizing the digital innovation possibilities within public services. Therefore, having a population that is accustomed to using ICT is beneficial for the service created in this research.

However, the findings suggest that the older adults do need some help with ICT occasionally, which is a result also mentioned in Slette-meås et al. (2018). The report further mentions that friends and family usually provide help for their problems, such as technical problems. However, not all older adults have family or friends nearby when problems arise, as mentioned in section 4.1, many older adults in Folldal live alone. Therefore, having a feature to get individual human help on demand, a feature mentioned by Bühler et al. (2014), and implemented in the prototype using the younger generation, could be useful.

5.1.5 The need for an established service

The findings suggest that a challenge for innovation in transportation is that the older adults want a tested system and that has obtained an established reputation, which confirms the results by Heinz and Kelly (2015). This could indicate that residents in rural areas are more prone to having an already tested system. Testing it in urban settings could have been beneficial for obtaining a reputation since these areas usually have a higher density of people. However, the current community-based transportation service is specified for rural areas since they seem to have a more trusting community Payyanadan and Lee (2018). Consequently, it would not be easy to test its actual use in urban areas, as trust seems to be an essential piece of the service. Furthermore, requiring a tested and well-established service can mean that they are still reluctant and skeptical surrounding the concept. This can be related to the other challenges found in the results concerning the lack of familiarity and having to readjust and change their behavior for the service's success.

5.2 Implementing the Service

The need for a change of behavior is essential in the final stage of service design thinking, the implementation stage. As mentioned in subsection 3.3.4, implementing the service requires investigating behavioral change. Finding the areas where changes are needed was found through the knowledge gained from the previous steps. The results in subsection 4.4.2 mention the need for the community to go through a readjustment process in order for the implementation to be successful. They are used to driving on their own and getting in the car without thinking much about it.

Therefore, to implement this service, the drivers should change their behavior to remember using the service and telling the system when they are driving. Nonetheless, they need to receive responses, mentioned as a challenge in subsection 4.4.2. Despite still having a car, the users should use the service to get familiar with the system before driving cessation and for the drivers to get responses. To summarize, the driving habits of the community need to change.

5.3 Implications for Practice

This section elaborates some of the implications for practice found through the research. First for public transportation services, and secondly, for creating a 'smart transport' system mentioned in subsection 1.1.1.

5.3.1 For public transportation services

The research explored the challenges related to public transportation services along with the participants. Two main implications for public transportation are found through the research, namely, communication and cooperation. The findings suggest that the public transport is inadequate to support the needs of older adults, in that the transportation is coordinated according to the school schedules. Further, the participant mentions that the bus that went full and directly to the capital of Norway was removed, while other busses are driving without passengers. This shows that cooperating with older adults to find their actual traveling needs and behaviors could be beneficial for both parties. Furthermore, cooperation with other transportation systems is essential to ease the transition between them. Finally, reaching out and communicating the offers the public transportation service in Folldal has to offer is necessary. The participants showed interest in planning for transportation along with an event, which is a concept the transportation could utilize.

Another notable finding is that the participants mentioned having to drive to the center and take the bus further from there. Consequently, it is easier to drive to the final destination, as they need to drive to the station regardless. Thus, investigating an optimal way of handling the first and last-mile challenge could benefit public transportation services. A possible solution could be a 'hybrid service' as mentioned Bittner et al. (2011) in subsection 2.3.1, consisting of using flexible other services for the first and last-mile. Hence, an opportunity lies in collaborating with a transportation service like the one created in this research.

5.3.2 Towards a smart transportation system

Implementing 'smart transport' in rural areas is about utilizing the resources available to create a mobility-as-a-service system, as mentioned in subsection 1.1.1. The primary idea is to combine people's transportation with transport for goods, in such that no opportunities for traveling are left unexploited. The prototype in

this research highlights an unexploited travel resource that can be utilized in a community: the people themselves through sharing rides and offering services.

5.4 Limitations and Future Work

This section describes the limitations of the study and what can be potential opportunities for future research. Limitations regarding generating the data have been elaborated in subsection 3.3.5, limitations regarding the design process in subsection 3.3.6, and the prototype in subsection 4.4.5. However, there are more limitations to this research to discuss.

5.4.1 External validity

This section discusses the external validity of the research, meaning how generalizable the findings are for different settings or people (Oates, 2006, p. 288). Firstly, the number of participants was lower than intended. The total number of participants was four, while intended to recruit between 5-10. This makes the generalizability of the research to the entire older adult population of Folldal questionable. Nonetheless, the volunteer helper works closely with many older adults daily and was able to provide significant insight into their general needs and behaviors, which could have created more generalizable findings.

Furthermore, the findings could be generalized for people with disabilities since they can have challenges related to driving and possibly benefit from having a door-to-door service that is not as costly as taxis.

Moreover, as mentioned in section 4.1, Folldal is a small town, where many live alone and with great distance amongst them. There are other communities like Folldal in Norway and other small places where the cultural aspects could be similar. However, further work is needed to investigate the generalization opportunities between rural areas.

5.4.2 Lack of generalizability

Consequently, a limitation to the research is the low sample of participants. Creating a questionnaire to increase the generability was considered distributed to the older adults on the Facebook group. However, the researcher was not able to distribute and collect the data due to time constraints.

5.4.3 An implementable prototype

Another limitation to the study is that the service was not fully interactive and hence could not be tested where it is intended to be used. Therefore, the feedback on the prototype through the group interview is not as precise and thorough as it should and could have been. As mentioned in Heinz and Kelly (2015), it is challenging to give specific feedback without having the possibility to test the service. Accordingly, the next step for this research would be to create a fully functioning prototype for the users to test and evaluate over a period of time.

5.4.4 Not included the most isolated

The part of the population that could benefit the most from this service are the ones that are lacking social connection and are feeling lonely or are isolated. Due to the limitations related to the COVID-19 pandemic, recruiting outside of the volunteer center, and especially those that are isolated, was challenging. The researcher could not go around meeting or searching for participants in the area due to restrictions and possible contamination. Therefore, the participants recruited were actively participating in the volunteer center, indicating that they are more social than the ones the service could be the most useful for.

5.4.5 Opportunities for future research

This research has created several other research opportunities. This section elaborates on these openings.

Exploring behavioral change

As mentioned in section 5.2, the participants forget about asking or offering a ride before driving. Therefore, investigating how to change the driving habits of rural communities such as Follidal is an opportunity for future research. Another related area for future work is how to motivate the use of the service.

Sharing rides in general

The public transportation offers a bus on demand for fixed-route transportation to avoid the busses driving empty. However, the bus does not drive more than one or two people per trip, making it less profitable for the transportation company, thus not further expanding to weekend and peak hours. Future research should investigate how services can be used to communicate and organize trips to increase the number of passengers per bus.

Combining paid drivers and private ride sharing

The participants mentioned that a concern was taking away the jobs from the professional taxi drivers in the community by acting as taxis themselves. To solve this, a combination of paid professional drivers and private ride-sharing, as also mentioned by Choi et al. (2019) could be explored as future work.

Investigating in first-last-mile using autonomous vehicles

Furthermore, the study found mixed feelings related to autonomous vehicles. However, the article by Eimontaite et al. (2020) found several features that could ease the concerns related to autonomous driving when the users actually got the opportunity to test the technology. Nonetheless, the participants found it intimidating but saw the possibilities with it, which means that there lies a potential there that should be further exploited, especially considering the first and last-mile challenge connected to public transportation in rural areas.

Chapter 6

Conclusion

Mobility is imperative in the life of older adults as it means being able to travel to desired places, being involved in the community, and have the opportunity of traveling spontaneously (Metz, 2000). The primary mode of travel for older adults in rural areas is by car. However, as they get older, body functions can degrade, and they find themselves at risk of losing their driver's certificate. Losing their license makes them dependent on other transportation services such as public transport, taxis, or traveling using friends and family. However, public transportation is inadequate, taxis are costly, and families can live far away, decreasing their mobility. Therefore, research on finding new or improved transportation services in rural areas is essential. Furthermore, due to technological advances, there lies an opportunity to address the problem using information and communication technologies (ICT).

Therefore, the research aimed first to identify the challenges and opportunities related to transportation services in rural areas. Secondly, to uncover design features for an ICT front-end to manage the service adapted for older adults' use. For this purpose, a service design thinking process was conducted along with the participants.

Based on the qualitative analysis of the data generated through the process, the findings suggested that a service based on ride-sharing could be implemented in rural areas to increase mobility for those unable to drive. Furthermore, the approach for finding the design features to implement in the service was from a contextual perspective, and the findings suggested that cultural factors significantly influenced the service.

To the researcher's knowledge, this study is the first to design and create, for and with older adults from rural areas, a culturally appropriated, community-based transportation service with an ICT front-end for managing the service. In addition, the research contributes to the literature of transportation mobility services by achieving the opinions of rural older adults on sharing rides with an

expanded social network and by investigating through a cultural perspective.

Furthermore, the prototype of the service itself contributes to knowledge and can be further built upon to be implemented in rural areas. The design features found through the process are also a contribution to knowledge. While the lack of participants limits the generalizability, these findings give insight into the challenges of older adults related to transport, designing for older adults, and designing and creating transportation services, which can be used by designers, policymakers, and transportation administrators.

However, to successfully implement the service, the researcher recommends that future research should explore how to change the driving habits of a rural community.

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Appendix A

NSD Approval

This chapter in the appendix consists of the documents surrounding getting the Norwegian Centre for Research Data (NSD) approval. The chapter consists of first the information pamphlet distributed to the participants with information about the project and giving informed consent. Secondly, the approval message by NSD. These documents are mentioned in chapter 3.

A.1 Information Pamphlet

Vil du delta i forskningsprosjektet

”Transport og sosialisering for eldre i distriktene”?

Dette er et spørsmål til deg om å delta i et forskningsprosjekt hvor formålet er å utvikle digitale transporttjenester for eldre i distriktene. Når digitale tjenester utvikles er det viktig at eldre også involveres i utviklingen for at plattformen skal bli brukervennlig. Forskningen vil undersøke om og hvordan et digitalt transport verktøy kan være nyttig for eldre som bor i distriktene. Som deltager vil du være med på å forme tjenesten ved å dele dine behov, erfaringer og meninger. I dette skrevet gir vi deg informasjon om målene for prosjektet og hva deltakelse vil innebære for deg.

Formål

Forskningen vil behandles av en student ved NTNU til gjennomføring av en masteroppgave under våren 2021. Formålet med prosjektet er å inkludere eldre (65+) som bor i distriktene i prosessen med å lage en digital prototype av en smart transport plattform. Inkludering vil bestå av å avdekke hvilke behov de har for transport, hva slags transportmetoder de bruker per dags dato, hvilke egenskaper de mener en slik plattform bør inneholde og hvordan den bør utformes for å være brukervennlig.

Oppgaven studenten skriver er relatert til et større forskningsprosjekt ved SINTEF, ”Smart transport i distriktene”. Formålet med dette prosjektet er å å lage nye tjenester og verktøy for transportplanlegging som er tilpasset distriktene. Prosjektet er samarbeid mellom Innland Trafikk, Follidal kommune, Sykehuset Innlandet, Entur og SINTEF.

Hvem er ansvarlig for forskningsprosjektet?

Studenten Ophelia Prillard, som går 5. klasse sivilingeniør på NTNU er ansvarlig for datainnsamlingen og masteroppgaven. Veilederen Babak A. Farshchian er hovedansvarlig for kvalitetssikring.

Hvorfor får du spørsmål om å delta?

Utvalget for forskningen er personer som er 65 år eller eldre, som bor i distriktene og som kan bruke transportmidler eller bevege seg uten menneskelig assistering. Det vil si at helsen skal tilsi at deltageren kan bevege seg på egenhånd.

Du har fått en henvendelse om å delta i prosjektet fordi vi tror du passer den beskrevne profilen.

Hva innebærer det for deg å delta?

Hvis du velger å delta i prosjektet vil du delta i et intervju og/eller gruppeintervju i løpet av våren som ledes av studenten som skriver oppgaven. Først et intervju som vil ta ca. 30-45 minutter og vil handle om hvordan du sosialiserer med vekt på ditt bruk av digitale verktøy, både før og under Covid-19 pandemien og hvilke transportmidler du bruker samt transporteringsmetoder. Senere vil det være to gruppeintervjuer som også vil vare 30-45 minutter. Det første vil fokusere på å utvikle selve designet og egenskapene til tjenesten. Med denne informasjon vil studenten forsøke å lage en tjeneste som det vil være mulighet til å gi tilbakemeldinger på ved siste gruppeintervju. Det vil gjøres lydopptak av intervjuene. Lydopptakene blir behandlet konfidensielt og vil transkriberes før de deretter slettes.

Det er frivillig å delta

Det er frivillig å delta i prosjektet. Hvis du velger å delta, kan du når som helst trekke samtykket tilbake uten å oppgi noen grunn. Samtykket kan trekkes både muntlig og skriftlig ved å ta kontakt med studenten som er ansvarlig for datainnsamlingen. Alle dine personopplysninger vil bli slettet. Det vil ikke ha noen negative konsekvenser for deg hvis du ikke vil delta eller senere velger å trekke deg.

Ditt personvern – hvordan vi oppbevarer og bruker dine opplysninger

A.2 Information Pamphlet

Opplysningene om deg vil kun brukes til formålene vi har fortalt om i dette skrevet. Vi behandler opplysningene konfidensielt og i samsvar med personvernregelverket. Kun studenten har tilgang til lydopptak før transkribering, og disse lagres på en SINTEF server. Transkribering kan deles med forskere på SINTEF. For å være sikker på at ingen uvedkommende får tilgang til personopplysningene vil navn og kontaktopplysningene dine byttes ut med en kode. Listen som knytter opplysningene til koden vil være adskilt og lagret på dataen et separat sted. Sitater fra intervjuer kan bli nevnt i sluttoppgaven eller i en eventuell publikasjon, men deltagere vil ikke kunne gjenkjennes.

Hva skjer med opplysningene dine når vi avslutter forskningsprosjektet?

Opplysningene anonymiseres når prosjektet avsluttes, noe som etter planen er senest 31.12.21.

Dine rettigheter

Så lenge du kan identifiseres i datamaterialet, har du rett til:

- innsyn i hvilke personopplysninger som er registrert om deg, og å få utlevert en kopi av opplysningene,
- å få rettet personopplysninger om deg,
- å få slettet personopplysninger om deg, og
- å sende klage til Datatilsynet om behandlingen av dine personopplysninger.

Hva gir oss rett til å behandle personopplysninger om deg?

Vi behandler opplysninger om deg basert på ditt samtykke. På oppdrag fra NTNU har NSD – Norsk senter for forskningsdata AS vurdert at behandlingen av personopplysninger i dette prosjektet er i samsvar med personvernregelverket.

Hvor kan jeg finne ut mer?

Hvis du har spørsmål til studien, eller ønsker å benytte deg av dine rettigheter, ta kontakt med:

Med vennlig hilsen
Babak A. Farshchian
(Forsker/veileder)

Ophelia Amalie Prillard
(Student)

Samtykkeerklæring

Jeg har mottatt og forstått informasjon om prosjektet "*Transport og sosialisering for eldre i distriktene*", og har fått anledning til å stille spørsmål. Jeg samtykker til:

- å delta i et intervju
- å delta i gruppeintervjuene
- at det vil bli tatt bilder under gruppeintervjuene

Jeg samtykker til at mine opplysninger behandles frem til prosjektet er avsluttet

(Signert av prosjektdeltaker, dato)

A.3 NSD Approval

Behandlingen av personopplysninger er vurdert av NSD. Vurderingen er:

Det er vår vurdering at behandlingen av personopplysninger i prosjektet vil være i samsvar med personvernlovgivningen så fremt den gjennomføres i tråd med det som er dokumentert i meldeskjemaet den 16.03.2021 med vedlegg, samt i meldingsdialogen mellom innmelder og NSD. Behandlingen kan starte.

MELD VESENTLIGE ENDRINGER

Dersom det skjer vesentlige endringer i behandlingen av personopplysninger, kan det være nødvendig å melde dette til NSD ved å oppdatere meldeskjemaet. Før du melder inn en endring, oppfordrer vi deg til å lese om hvilke type endringer det er nødvendig å melde:

nsd.no/personverntjenester/fyll-ut-meldeskjema-for-personopplysninger/melde-endringer-i-meldeskjema

Du må vente på svar fra NSD før endringen gjennomføres.

TYPE OPPLYSNINGER OG VARIGHET

Prosjektet vil behandle alminnelige kategorier av personopplysninger frem til 31.12.2021.

LOVLIG GRUNNLAG

Prosjektet vil innhente samtykke fra de registrerte til behandlingen av personopplysninger. Vår vurdering er at prosjektet legger opp til et samtykke i samsvar med kravene i art. 4 og 7, ved at det er en frivillig, spesifikk, informert og utvetydig bekreftelse som kan dokumenteres, og som den registrerte kan trekke tilbake. Lovlig grunnlag for behandlingen vil dermed være den registrertes samtykke, jf. personvernforordningen art. 6 nr. 1 bokstav a.

PERSONVERNPRINSIPPER

NSD vurderer at den planlagte behandlingen av personopplysninger vil følge prinsippene i personvernforordningen om:

- lovlighet, rettferdighet og åpenhet (art. 5.1 a), ved at de registrerte får tilfredsstillende informasjon om og samtykker til behandlingen
- formålsbegrensning (art. 5.1 b), ved at personopplysninger samles inn for spesifikke, uttrykkelig angitte og berettigede formål, og ikke viderebehandles til nye uforenlige formål
- dataminimering (art. 5.1 c), ved at det kun behandles opplysninger som er adekvate, relevante og nødvendige for formålet med prosjektet
- lagringsbegrensning (art. 5.1 e), ved at personopplysningene ikke lagres lenger enn nødvendig for å oppfylle formålet

DE REGISTRERTES RETTIGHETER

NSD vurderer at informasjonen om behandlingen som de registrerte vil motta oppfyller lovens krav til form og innhold, jf. art. 12.1 og art. 13.

Så lenge de registrerte kan identifiseres i datamaterialet vil de ha følgende rettigheter: innsyn (art. 15), retting (art. 16), sletting (art. 17), begrensning (art. 18) og dataportabilitet (art. 20).

Vi minner om at hvis en registrert tar kontakt om sine rettigheter, har behandlingsansvarlig institusjon plikt til å svare innen en måned.

FØLG DIN INSTITUSJONS RETNINGSLINJER

NSD legger til grunn at behandlingen oppfyller kravene i personvernforordningen om riktighet (art. 5.1 d), integritet og konfidensialitet (art. 5.1 f) og sikkerhet (art. 32).

Sintef er felles behandlingsansvarlig institusjon. NSD legger til grunn at behandlingen oppfyller kravene til felles behandlingsansvar, jf. personvernforordningen art. 26.

Teams er databehandler i prosjektet. NSD legger til grunn at behandlingen oppfyller kravene til bruk av databehandler, jf. art 28 og 29.

For å forsikre dere om at kravene oppfylles, må dere følge interne retningslinjer og eventuelt rådføre dere med behandlingsansvarlig institusjon.

OPPFØLGING AV PROSJEKTET

NSD vil følge opp ved planlagt avslutning for å avklare om behandlingen av personopplysningene er avsluttet.

Appendix B

Email from Resident in Kvikne

This appendix contains the email with information about the ride-sharing program they tried to implement in Kvikne, Tynset. The information is used with consent from the Kvikne resident sending the email. However, areas that could breach privacy have been removed. These areas are covered, but the meaning of the sentences is maintained. This document is first mentioned in chapter 3, but is also mentioned throughout chapter 4.

Ja det stemmer at vi prøvde å få til samkjøring på Kvikne.

Siden Kvikne er ei lita bygd og man stadig må reise fem mil (en vei) for å dra til Tynset som er kommunesenteret å lage systemet i stedet for at man sitter å kjører en og en i hver sin bil. Det er også dårlig tilbud med kollektivtransport her.

en gjestebok der folk kunne etterlyse skyss og/eller legge inn når de skulle hit og dit så andre kunne ta kontakt for å få skyss.

Det kom inn fire-fem tilbud om skyss i starten, men jeg tror ikke noen av oss som tilbød skyss fikk henvendelser fra folk som ville sitte på. Jeg vet ikke hvorfor det ikke slo an, men tror folk vil være selvstendige og ikke måtte risikere å vente på andre. Mange tar kanskje turen litt spontant også. Tilbudet lå ute på nettsiden lenge, men siden det ikke skjedde noe og ingen virket interessert så ble ikke tilbudet videreført når vi flyttet hele nettstedet over på ny plattform nå på nyåret. Synes det er synd at tilbudet ikke slo an, Ser på Facebook at folk av og til etterlyser skyss der, så kanskje de foretrekker det heller enn å bruke nettsiden.

Appendix C

Interview guides

The following chapter consists of the interview guides used for generating data in the research. These guides are mentioned in chapter 3. The first guide is from the first group interview during the exploration stage of service design thinking. The second guide describes how the co-design workshop was conducted—lastly, the guide for obtaining feedback on the prototype through a group interview.

C.1 Exploration Group Interview

Intervju på norsk

1. Velkommen:

2. Temaene for intervjuet i dag er:

- Transport og deres reisevaner, bruk av digitale verktøy og sosialisering og livskvalitet. Knyttet til Smart Transport – gjøre det mer attraktivt i distriktene ved å tilby bedre og smartere transport.
- Resultatene fra dette intervjuet vil brukes videre til å finne design og egenskaper en plattform burde ha for at dere ønsker å bruke den og for at den skal være nyttig.

3. Intervjuet vil være sånn at:

- Jeg stiller et spørsmål, så kan dere gjerne diskutere rundt spørsmålet
- Min jobb å bare å omdirigere diskusjonen litt om vi skulle begynne å spore litt av, komme med et nytt eller tilleggsspørsmål eller spørre dere enkeltvis om det passer seg.

4. Viktig å vite at:

- Det er ingen riktige eller gale svar.
- Dere trenger ikke være enig med sidemannen
- Også må dere gjerne snakke en og en, siden møte vil bli tatt opp.
- Håper dere også har fått tatt en titt og underskrevet på samtykkelsesbrevet/informasjonsbrevet

Type spørsmål	Topic addressed	Question	Dybdespørsmål
Åpning	Om deltagere	Vi kan begynne med navn og alder, og valgfritt om det er noe dere liker å gjøre? Kanskje litt om hvor lenge dere har bodd i Folldal? Hvordan dere kom dere hit i dag?	
Key	Planlegging	Hvordan planla dere turen? Og når?	
Key	Under reisen	Hvordan opplevde dere reisen?	
Key	Syn på transporterering	<ul style="list-style-type: none"> - Hva liker dere med den transporteringsmetoden? - Er det noe dere ikke liker? - Hvis dere kunne styre og endre noe ved denne metoden, hva ville det vært? 	
Transition /Key	Reise til et nytt sted	Kan dere fortelle meg om en gang dere skulle reise til et nytt sted/ et sted for første gang?	
	Planlegging	<ul style="list-style-type: none"> - Hvordan og når planla dere reisen? Hva syns dere om å planlegge, går det fint? - Brukte dere noe digitale verktøy? App/PC/ eller telefon? 	<ul style="list-style-type: none"> - Planlegger dere reiser på forhånd eller når planlegges de som regel? - Reisetid: Planlegger dere for at reisen skal ta kortest mulig tid eller hva legger dere mest vekt på? - Føler dere at dere er fleksible i forhold til tid?
	Under reisen	<ul style="list-style-type: none"> - Hvordan opplevde dere reisen? - Hva gir dere glede når dere reiser? - Hva syns dere er plagsomt eller ikke liker? 	<ul style="list-style-type: none"> - Dør-til-Dør- service? Er det viktig for dere? - Hva hadde dere syntes om å bli hentet, men sluppet av ved en buss/tog? Og deretter bli hentet og levert?

C.2 Exploration Group Interview

	Etter reisen	<ul style="list-style-type: none"> - Hva var det dere likte/ikke likte med reisen? - Kom dere helt frem til der dere skulle? (Fikk dere parkering)? - Skulle dere ønske dere kom nærmere? 	
Transition	Generell reising	<ul style="list-style-type: none"> - Kan dere tenkte tilbake til den siste uke/de to siste ukene, hvordan har dere reist rundt for å handle, eller besøk venner/familie eller annet? - Hvordan og når bestemmer du deg for å bruke transport? - Hva er det viktigste for dere når det gjelder reising? 	
Key	Hvis bil	<ul style="list-style-type: none"> - Hva syns dere om å kjøre bil? - Hva syns dere om å kjøre når det er mørkt eller dårlig vær/veier? - Hvorfor foretrekker dere å kjøre? - I hvilke tilfeller ville du byttet ut bilen med annen type transport/offentlig transport? - Hva kan motivere dere til å ikke ta bilen, men heller oppsøke andre kjøremetoder? 	<ul style="list-style-type: none"> - Hvis dere fikk mulighet til å bli plukket opp av en venn/familie? Ville dere heller gjort det? - Hvis personen ikke var kjent, men dere hadde masse informasjon om sjåføren? Isåfall hva måtte dere ha vist om personen for å stole på han/henne? - Hentet sammen med en annen i privat/offentlig bil – som å dele en taxi
Key	Kjørestopp	<p>Forskning nevner at eldre gradvis blir mindre egnet til å kjøre bil og at det kan føre til ulykker.</p> <ul style="list-style-type: none"> - Hva tenker dere om dette? - Har dere erfart noe problemer så langt med bilkjøringen? Er dette med kjørestopp noe dere diskutere blant dere? - Har dere tenkt noe på hvordan det blir når dere ikke vil/kan kjøre lenger? - Hva er planen da? 	
Key	Hvis venner og familie	<ul style="list-style-type: none"> - Hva syns dere om å reise med venner og familie? - Er det fleksibelt nok? - Hva syns dere om å måtte spørre om det? 	
Transition	Offentlig transport	<ul style="list-style-type: none"> - Har dere brukt offentlig transport her? - Hvordan opplevdes det? - Hva liker dere eller liker ikke ved den? 	
	Motivering for offentlig transport	<ul style="list-style-type: none"> - Hva tror dere kunne motivert dere til å bruke offentlig transport mer? (Miljø? Kostnad? Fleksibilitet?) - Hvilke egenskaper skulle den hatt for at dere ville brukt den mer? - Hvis dere kunne endret en ting med offentlig transport hva ville det vært? Hvorfor? 	-

C.3 Exploration Group Interview

Transition	Sosialisering	<p>Transport er knyttet til sosialisering – transport muliggjør for sosialisering</p> <ul style="list-style-type: none"> - Fortelle meg om hvordan dere har sosialisert eller holdt kontakten med familie/venner for eksempel de siste ukene? Bruker dere noe digitalt verktøy for å holde kontakten? - Skiller det seg fra hvordan dere sosialiserte før - Ville dere gjerne vært mer sosiale? - Hva med å møte nye folk? <p>Kunne det vært spennende å kunne møte nye mennesker eller holde kontakt med venner og familie med offentlig transport? Hvordan ser dere for dere at denne kombinasjonen ville sett? Hva ville vært viktig at verktøyet kan gjøre?</p> <p>Hva tenker dere om den mulighet? Kunne det virket motiverende for å heller la bilen stå og gå for nye transportmetoder?</p>	
Transition	Digitale verktøy	<p>Verktøyet som eventuelt blir laget, kommer til å være til en viss grad digital.</p> <ul style="list-style-type: none"> - Derfor lurer jeg litt på hva dere bruker av digitale ting i løpet av en uke for eksempel. Har dere PC hjemme? Mobil? Hva slags? Noe annet digitalt/teknologisk som dere kommer på? - Hva syns dere om det? - Hvis det er noe dere kunne endret på det verktøyet/mobilen, hva ville det vært? - Er det noe dere liker ved verktøyet? - Har dere prøvd nettbrett, hva syns om det? 	- Få opplæring i plattformene?
Transition	Livskvalitet	<p>Det siste jeg lurer på er litt på hva som gir dere glede og om det er nok som ikke gjør det, eller noe som gjør dere frustrerte.</p> <p>Hvis dere nevne en ting som kunne forbedret livskvaliteten til folk på deres alder i Folldal?</p>	
SLUTT		Er det noe mer dere har lyst til å tilføye?	

C.4 CO-Design Workshop Guide

Design workshop - GUIDE

1. Hva bringer dagen?
 - Tanker og oppsummering fra forrige intervju
 - Delt opp i tre deler
 - Jobbe to og to sammen
 - Diskutere
 - Kan lage tankekart, liste opp punkter eller tegne
2. Tanker fra intervjuene
 - Dårlig samarbeid mellom de offentlig transport aktørene
 - Familie kan bo langt unna og man kan ikke være avhengig av de for transportering
 - Må flytte til sentrum når man ikke lenger kan kjøre – sentraliserende
 - Ungdommen hjelper med å lære bort og forstå digitale verktøy
 - Eldre møtes og deler deres erfaringer med ulike digitale verktøy - "Dette fant jeg ut av"
 - Facebook-gruppe der eldre er aktive og deler historier og diskuterer ulike ting
 - Deres tanker?
3. IDEA GENERATION - Beskriv den beste eller morsomste gjenstanden/verktøyet du har
4. FØRSTE DEL - Hva har dere brukt? Hva har dere hørt om?
 - Vise logoene for forskjellige plattformer (Vy, Snapchat, Youtube)
 - Be de skrive ned. Så diskutere.
5. ANDRE DEL – Deres meninger, alle meninger gode meninger.
 - Vise Facebook – Hva liker dere, hva liker dere ikke?
 - Vise gruppen "Du vet du er Folldøl når:". Hvorfor tror dere den blir så hyppig brukt?
 - Vise Vy – hva liker dere, hva liker dere ikke?
 - Diskusjon rundt andre plattformer? Snapchat?
6. TREDJE DEL – Kombinering og fantasi
 - Kombinere sosialiseringsplattform og transportplattform – det beste av begge deler og hvordan kunne det gått seg til? Kan dere lage tankekart eller skrive ned noen ideer?

C.5 CO-Design Workshop Guide

- SCENARIO: Nå skal dere se for dere at dere bruker dette verktøyet til å dra skal på tur sammen – hvordan ville dere gjort det? Hva med om det er en til som vil være med i siste liten?
 - SCENARIO: Ordne Skyss – dere vil til sentrum for å handle hvordan ville dere gjort det? Hvordan ville dere gjort det ved å bruke Facebook for eksempel?
7. Det 'Smarteste' verktøyet - Se for dere at vi nå lever inn i fremtiden og dere har et verktøy hjemme hos dere som og at dere nå har mulighet til å lage deres helt perfekte verktøy som kan brukes til hva enn dere vil og gjøre hva dere skulle ønske. Hvilke egenskaper ville det hatt?

C.6 Prototype Group Interview

Gruppe intervju for tilbakemelding på prototype - GUIDE

1. Hva bringer dagen?
 - Laste ned applikasjon "Figma Mirror"
 - Her vil det vises et utkast om hvordan det digitale verktøyet skal fungere – så det er fokus på egenskapene
 - Fem forskjellige scenarioer
 - Guider dere gjennom og sier hva dere skal trykke på
 - Jeg spør dere litt spørsmål underveis som dere kan diskutere
 - For hvert scenario – skrive ned hvert fall en ting dere likte og en ting dere ikke likte - gjerne notere underveis
 - Gjerne del alle tanker underveis også – "tenke høyt"
 - Liten pause når vi er halvveis ☺
2. Fra tidligere gruppemøter:
 - Behov for andre transporteringsmetoder: Dele bil kan være en viktig ressurs som kan organiseres for å gjøres enda bedre
 - Avhengig av bil eller flytte til sentrum
 - Ungdommen og eldre kan hjelpe hverandre
 - Kulturen i Folldal: Et samarbeidsvillig samfunn der folk gjerne vil hjelpe hverandre
 - Dere kjenner til og bruker mange ulike digitale verktøyer (Facebook, Vy, Youtube, Snapchat, Teams osv.)
 - Deres tanker?
3. FØRSTE SCENARIO – Du skal på helgetur og vil ta toget fra Hjerkind
 - Registrere tur som passasjer
4. ANDRE SCENARIO - Du har en pakke som har ankommet Coop Prix i sentrum og vil gjerne få den hentet.
 - Finne tur
5. TREDJE SCENARIO - Du skal til tannlegen på Tynset og vil planlegge tur.
 - Planlegge tur
6. FJERDE SCENARIO - Du har litt ekstra tid på torsdag og vil legge det inn i tilfelle noen som skulle trenge hjelp eller skyss
 - Hjelpe/tilby skyss og godta forespørsel
7. FEMTE SCENARIO - Du er på en sosial plattform og ser et arrangement du ønsker å delta på
 - Få skyss til arrangement
8. Diskusjon generelt rundt prototypen
 - Noen scenarioer eller deler av verktøyet dere vil gå gjennom en gang til?

Appendix D

Translation of Quotes

The chapter consists of quotes from the interview transcripts. These quotes are described both as the original quote in Norwegian and translated into English. In addition, each of them is connected to an ID used to identify the quote in chapter 4. The chapter is divided into three parts: the transcripts from the three interviews, the first during exploration, the second transcript from the co-design workshop, and lastly, from obtaining feedback on the prototype.

D.1 Quotes from Exploration Interview

Table D.1.1: Translation of quotes from the exploration group interview.

ID	Original Quote	English Translation
1.1	"så lenge det er bil. Blir verre når man mister sertifikatet."	"as long as there is a car. Gets worse when you loose the certificate."
1.2	"kjører selv, foreløpig"	"driving on my own, for the time being"
1.3	"Jeg har folk hjemme på gården, men kan ikke være avhengig av dem til å høre med hit og dit."	"I have people at home on the farm, but I cannot rely on them to drive me here and there."
1.4	"å få med seg bagasjen er vanskelig."	"bringing the luggage with you can be difficult."
Continued on next page		

Table D.1.1 – continued from previous page

ID	Original Quote	English Translation
1.5	"Jeg er avhengig av bil til buss, og buss må korrespondere med toget. Men han garanterer det ikke. Av og til er bussen forsinket og da venter ikke toget. Og da har billetten gått."	"I am dependent on driving to the bus, and the bus has to correspond with the train. However, he does not guarantee it. Sometimes the bus is late, and the train does not wait. And then the ticket expires."
1.6	"bussen går ofte tomme, siden de ikke går akkurat når du skal i vei."	"the bus often is empty, since they do not go precisely when you are leaving."
1.7	"Det var mer lettvindt før, gikk buss direkte til Oslo, så man slapp å bytte. Tilbudet var lagt ned. Selv om bussen gikk full."	"It was easier before, a bus went straight to Oslo, so you did not have to switch [bus]. The offer was canceled. Even though the bus went full."
1.8	"går bare de dagene det er behov, så det er jo smart."	"only operates the days there is a need, so that is smart."
1.9	"Den går kun til sentrum, så de som bor lenger ned i bygda må i tilfelle leie drosje privat herfra og hjem."	"It only goes to the center, and those who live further down the countryside have to, in that case, order a taxi privately from here to home."
1.10	"Men drosjeprisen, over så lange avstander, det er dyrt."	"the taxi fare, over such long distances, that is expensive."
1.11	"Det er nok det vi er flinke til i distriktene. Kunne sikkert vært enda flinkere."	"That is probably what we are good at in the districts. But, we could probably be even better."
1.12	"En helt ukjent fra en helt annen plass så kanskje jeg blir litt skeptisk".	"A total stranger from a totally different place, then maybe I would be a little skeptical."
1.13	"Det er litt buss som korresponderer hvis det er bra føre, og bussjåføren tørr å kjøre."	"There are some buses corresponding if the driving conditions allows it, and the bus driver dares to drive."
1.14	"Bruker mye [nett]brett. For nettbanken blant annet."	"use the tablet a lot. For online banking, among other things."
1.15	"det er det med at det er tilgjengelig"	"it is that concerning availability"

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Table D.1.1 – continued from previous page

ID	Original Quote	English Translation
1.16	det kan da være greit å dele på drivstoff. Spesielt overfor folk som ikke kjører selv, da har man ikke den faste utgiften med bil.	"it can be nice to share fuel. Especially for the people that do not drive on their own, as they do not have the fixed expense of owning a car"
1.17	"Og kan ikke gjengjelde tjeneste"	"So, they cannot return the favor"

D.2 Quotes from Co-Design Workshop

Table D.2.1: Translation of quotes from co-design workshop.

ID	Original Quote	English Translation
2.1	"Jeg vil gjerne ha sjåfør på den jeg"	"I personally would like a driver on it."
2.2	"det høres så nifst ut."	"it sounds so scary."
2.3	"Jeg tror ikke vi hadde blitt lei oss, hvis det kom en sånn bil eller flere i Folldal som tok oss fra A til Å."	"I do not think we would be sad, if one or more of these cars came to Folldal to drive us around."
2.4	"Det blir dyre briller, da blir de dobbelt så dyre."	"That would be some high priced glasses, they would become twice as expensive."
2.4	"Jeg trenger skyss, og jeg skal kjøre."	"I need a ride, and I am going out to drive."
2.5	"Der de legger inn både behov med tider og steder de skal. Og likedan så kan de som skal noen plass legge inn når de kjører og hvor de kjører."	"Where they enter their needs with both the time and places they are going. And likewise, those who are going somewhere can enter when they are driving and where they are going."
2.6	"De er 17 stykker i klassen, 17 biler for å frakter 17 unger på bursdag. Det holder med noen få."	"There are 17 students in the class, but we don't need 17 cars to transport 17 kids. Just a couple of cars will do."
2.7	"det er det med kjøre og hviletid på disse sjåførene som er trasig ute i distriktene på grunn av avstandene en skal kjøre i løpet av en dag."	"it is the driving and rest-time for these drivers that are problematic in the districts due to the distances one has to drive during a day."
2.8	"Begynner med noen få, så prater dere med flere så blir flere med"	"It starts with a few people, then they talk to others, and more people join the ride"

D.3 Quotes from Prototype Group Interview

Table D.3.1: Translation of quotes from assessing prototype through group interview.

ID	Original Quote	English Translation
3.1	"Kalenderen var stor og oversiktlig så du trykker på riktig og ser etter at du har trykket riktig."	"The calendar was large and clear so you can press correctly and see that you have pressed correctly"
3.2	"Hvis en opplever å få hjelp og får gitt hjelp så, og opplever det positivt"	"If one experiences that they are getting help and are able to offer help, and the experience is positive"
3.3	"Joda, kunne nok det. Prøvd i hvert fall og se om det var noe respons."	"Yes, I probably could. I would at least have tried it and see if there was any response."
3.4	"Ordentlig kjekt."	"Really nice."
3.5	"får vi vet jo at det er mange som kjører."	"we know there are many driving."
3.6	"Men vi aner ikke hva den trafikken som kjører forbi skal."	"But we have no idea where the passing traffic is headed."
3.7	"for da er det jo de personen som har sagt at 'Joda, du kan bare spørre meg om både det ene og det andre fordi jeg kjører jo rundt her uansett.'"	"because then the person has said that 'Yes, you can ask me about both this and that because I am driving around here anyway'."
3.8	"Så her har de jo sagt at 'ja, bare spør hvis jeg er nærheten uansett'. Da vil de jo være positive til henvendelsen."	"So here they have said that 'Yes, just ask if I'm close anyway'. Then they will be positive to the inquiry."
3.9	"Ja, mye bedre!"	"Yes, much better!"
3.10	"senest i morges."	"no later than this morning"
3.11	"Greit å ringe da, så får man tak i personen med en gang."	"It is nice to call, so you can get hold of the person right away."
3.12	"Nei, jeg ser bare mulighetene"	"No, I see only opportunities."
3.13	"Så det kan jo sikkert være greit å få velge hvor stor omgangskrets du skal nå ut til."	"So it can probably be nice to be able to choose how large a circle of friends you will reach."

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Table D.3.1 – continued from previous page

ID	Original Quote	English Translation
3.14	"Hvis vi får noen som kjenner den personen, som vi kjenner, og får litt informasjon om den som skal kjøre kanskje. Så er det vel ikke så farlig."	"If we get someone that knows that person that we know, and we get some information about the one driving. Then it is probably not that risky."
3.15	"Det er jo et lite sted så sannsynligheten for at det er noen kjenner og, kan jo være stor."	"It is after all a small place, so the probability that it is someone we know, can be quite big."
3.16	"Smart Transport Folldal'-gruppa".	"The 'Smart Transport Folldal'-group"
3.17	"Vi kan jo vite at naboen kjører, men det er ikke alltid man vil bry en allikevel fordi man vet ikke om det passer."	"We can know that the neighbor is driving, but one does not bother asking anyway, since you do not know if they are available."
3.18	"dette må være sånn vinn-vinn system."	"this has to be a win-win system."
3.19	"det lille tastetrykket her kan gjøre de engasjerer seg og kommer seg ut."	"a small keystroke here can make them get more involved and getting out."
3.20	"Greit å ringe da, så får man tak i personen med en gang."	"Nice to call, then you can get a hold of the person right away."
3.21	"fort og greit gjort. Ikke noe du har overhørt."	"it is done quickly and easily. Nothing you have overheard."
3.22	"Da har man hatt en skikkelig prat. Da kjører de ikke bare forbi da har man liksom en avtale. En avtale vi har snakket om."	"You have had a proper conversation. They will not just drive past because you have an agreement. An agreement you have talked about."
3.23	"Joda, kunne nok det. Prøvd i hvert fall og se om det var noe respons."	"Yes, I probably could. I would at least have tried it and see if there was any response."
3.24	"Hvis en opplever å få hjelp og får gitt hjelp så, og opplever det positivt."	"If one experiences that they are getting help and are able to offer help, and the experience is positive."
3.25	"Må prøves først tror jeg, før det tas i bruk."	"It would have to be tried out first, I think, before it is used."

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Table D.3.1 – continued from previous page

ID	Original Quote	English Translation
3.26	"Må nok ha sjekket at noen andre har gjort det før og at det har gått bra da."	"Have to make sure that someone else has used it before and that it has gone well then."
3.27	"Det høres litt nifst ut å ikke ha en sjåfør da."	"It sounds a bit scary not having a driver."
3.28	"er ikke vant til selvkjørende biler."	"we are not used to self-driving cars."
3.29	"Vi kaster oss i bilen og ser mange ganger at når vi ender opp på arrangementet at 'oi, der var den og ja, og ja der var naboen den og ja'."	"We throw ourselves in the car and many time we end up at an event and 'oh, there is that guy, and there is the neighbor'."
3.30	"og da kjører jo naboen og, og henter ungen sin, og du kjører og henter ungen din, og så tenker man jo etterpå at det er jo dumt å kjøre etter hverandre for samme ærend"	"then the neighbor drives to pick up his kid, and then you drive to pick up your kid, and then you think afterwards that it is silly to drive one after the other for the same errand."
3.31	"Hadde vært best å ringe. Ringe med video, da får en se"	"Would have been best to call. Calling with a video, then you can see them as well"

