

Carsharing as the future of mobility:
Exploring the potential of carsharing in rural areas



Colophon

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Abstract

Dutch rural liveability is challenged as the accessibility of amenities in rural areas becomes more problematic and the provision of public transport decreases. One of the possible solutions to counter these declines is the introduction of car sharing in rural areas. The purpose of this research is to explore whether the introduction of car sharing is a valuable addition to the current mobility structure in rural areas. This is done by answering the following question: *What conditions influence the success of shared car services in rural areas like North-East Drenthe?* A wide body of literature is available on successful urban car sharing, however knowledge on whether car sharing has potential in rural areas is very limited. Therefore this research starts with a literature review on existing car sharing projects in rural areas. Further analysis is done by analysing trip data from a rural car sharing pilot and by distributing a survey amongst (potential) users. This car sharing pilot takes place in a rural area in the provinces of Drenthe and Groningen. Stakeholders organically applied the process of reflective learning which helped to reflect on the progression of the pilot and their own contributions. However, more active application would have led to more progress in the pilot and more accountability amongst stakeholders. The results of the data analysis show that the cars were used less often than expected for which several explanations were found. The pilot faced a period of high abuse, had to be stopped after which entry barriers were increased. The survey results show that some users are dissatisfied with the pricing, the lack of advertising/visibility of the shared cars and communication with the shared car provider. Therefore, this research recommends improved information provision on the pricing and active campaigning to raise awareness of the existence of the shared cars. There is hope for the pilot as the majority of respondents indicate that they are willing to use the shared car again in the future and recommend usage to others. The second year of the pilot will therefore determine the eventual success of the pilot.

Keywords: Carsharing, rural areas, case study, pilot, reflective learning, accessibility, rural liveability.

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1. Introduction

1.1. *Relevance: Background and problem definition*

It has been almost 140 years since Carl Benz applied for a patent on his ‘vehicle powered by a gas engine’. Nowadays we consider this to be the first car and a milestone in the world of mobility. Since then, major changes in the automotive industry took place. In the beginning of the 20th century, American Henry Ford started the mass production of cars and allowed for more people to own and use a car. Nowadays, another major shift is occurring with hybrid and electric vehicles seeing an increase in their market share. In the Netherlands, over the past decades hybrid vehicles slowly gained in their market share. It is only in the last few years that full electric vehicles see a stark increase. Whereas there were only 7500 electric vehicles in 2015, this number increased to 174000 in 2021 (CBS, 2021a). Although, this increase could be the effect of people’s intrinsic motivation to reduce their carbon emissions or as it has become more practical with the increase of charging stations, one can fathom that the active role of the government in promoting electric driving also has its role. During the past years, the Dutch national government has provided several subsidies to civilians for the purchase of electric vehicles by civilians (NOS, 2023).

Car ownership has also continued to rise during the past years in the Netherlands. In 2023, the total number of cars in the Netherlands is at 8.9 million which is half a million more than five years before (CBS, 2023). Additionally, each year, with the exception of 2020 as the result of the Covid-19 pandemic, kilometres travelled also increased to a total of 104.5 billion kilometres in 2021 (CBS, 2021b). Approximately, 70% of these kilometres were travelled by car, the second most opted mode of transport was a bike and accounted for only 10% of all kilometres (CBS, 2021c). It makes sense that car kilometres are higher than bike kilometres as cars are a suitable mode of transport over long(er) distances whereas bikes are only used for short(er) distances. However, public transport, which is also a suitable mode of transport for longer distances, accounts for only 8% of kilometres travelled (CBS, 2021c). An increase in kilometres travelled by public transport could have several positive consequences. Once more people use public transport, less people use their private car which leads to a reduction of traffic jams and decreases the negative impact on the environment. Additionally, as more people use public transport, earnings increase which supports the creation of new routes or offers the possibility of increasing the number of buses, trains, trams or metro’s on existing routes making public transport a more attractive mode of transport (Redman et al., 2013).

Improvements in the provision of public transportation have positive consequences for the mobility of people who are living in rural areas. These are areas where public transportation is currently most scarce which results in rural residents having less mobility options than urban residents. Increasing the public transportation in rural areas would positively impact the accessibility and related liveability of rural areas (CROW-KpVV, 2021; Székely & Novotny, 2022). However, a viable exploitation of the current public transport network is becoming increasingly difficult (CROW-KpVV, 2021). Breaking this trend by policy measures that promoted public transport have not resulted in the desired results. Therefore, the report by the CROW-KpVV (2021) advises to look into more flexible modes of transport. One of these potential flexible modes of transport are shared cars.

Carsharing typically refers to a system in which a user pays the owner of a car for the use of this car for a trip. There are a variety of return options ranging from returning the car to the starting point of the trip to the option of returning the car at any given destination (Jorritsma et al., 2021). The first shared car scheme originated in Switzerland, 1948 by a group of private individuals (Nansubuga & Kowalkowski, 2021). In the following years the first schemes emerged in countries like France and the Netherlands. Nevertheless, it is only since the beginning of the 21st century that the first substantial increases in carsharing numbers can be noticed. The exact number of shared cars is hard to determine as different researchers include different types of carsharing. For example; in 2020, a total of 24000 shared cars were available in the Netherlands, 8000 of these were not used by businesses themselves and therefore accessible for potential users, but P2P services are excluded in this calculation (see chapter 2.3) (CROW, 2021). Jorritsma et al. (2021) do include P2P services which increases the number of cars to more than

64000 in 2020. The geographical location of these shared vehicles is highly concentrated in urban areas. In the largest urban areas of the Netherlands, inhabitants had access to approximately 63 cars per 100000 inhabitants, whereas this is only one car per 100000 inhabitants in the most rural regions (CROW, 2022). In other words, carsharing has seen a rise in urban areas but is still hardly existent in rural areas.

In recent years the idea of introducing carsharing in rural areas has slowly become a topic of interest. It is seen as an opportunity to battle problems regarding accessibility. Shared cars can be placed on hubs to extend the catchment area of existing public transportation networks to more rural areas where public transport is scarce or non-existent (Shaheen & Chan, 2016). By placing shared cars on hubs, inhabitants of remote areas can still reach the hub and continue their trip by public transportation. This implementation of shared cars is known as first and last mile connectivity (Shaheen & Chan, 2016). Additionally, shared cars also offer opportunities in the search for more sustainable transport methods. Car sharers on average drive 15-20% less kilometres than car owners, one shared car replaces between 9 and 13 privately owned cars, reduces parking and congestion problems and reduces CO₂-emissions (CROW-KpVV, 2016). The government tries to actively introduce and promote car sharing in rural areas. For example, by providing subsidies for carsharing to 20 rural municipalities as was done by former minister Van Veldhoven (Maas, 2019). Nevertheless, other institutions still pose barriers in already successful rural carsharing. An example of this is when a six year long successful car sharing scheme in Deventer, the Netherlands had to be stopped as their insurance company was no longer willing to insure the cars as they found it too risky and costly (Penris, 2019). This shows that there are still hurdles to overcome.

One of the chosen routes to introduce carsharing in rural areas is via pilots. Pilots are a relatively cost friendly way of finding out whether specific areas are suitable for carsharing. Generally, the decision to implement a pilot is made after an ex-ante research concludes that an area and its inhabitants are positive towards carsharing (Bijlsma, 2022). An example of a pilot that started after the ex-ante research indicated that there is enough interest amongst inhabitants is the carsharing pilot Hondsrug Noord (Kamminga et al., 2022c).

The pilot Hondsrug Noord is a carsharing pilot with the plan to make 13 electric cars available for public use from September 2022 onwards (Kamminga et al., 2022a). Due to unforeseen circumstances related with permits for loading stations, not all designated locations had a car available when the pilot started. The cars are located in rural regions in the Dutch provinces of Drenthe and Groningen till October 2024. The originally chosen locations of the cars can be seen in figure 1. Seven of the cars are placed in village centres, six are placed at hubs at the edges of villages. Whether the pilot becomes an actual success still remains to be seen. A successful car sharing scheme should be able to sustain itself by attracting enough users so that costs are covered. However one can also look beyond economic parameters to determine its success. Carsharing can also help in the challenge of creating more sustainable ways of transportation, or make less spatially accessible regions more accessible (CROW-KpVV, 2016; Van Wee et al., 2013).



Figure 1. location of the shared cars in carsharing pilot Hondsrug Noord (Province of Drenthe, n.d.).

1.2. Research aim and questions

The aim of this study is to analyse the potential of carsharing in rural areas. This is done by researching the carsharing pilot Hondsrug Noord. The findings will be compared and contrasted to the ex-ante findings by Kamminga et al. (2022c) and together add to the academic understanding of carsharing in rural areas. Additionally, if necessary, based on the findings of this research changes can be made to the ongoing pilot Hondsrug Noord if these changes improve the pilot and usage of the shared cars. Whether changes are necessary is determined by a constant evaluation of the pilot. This is done by applying the strategy of reflective learning during the pilot (Kamminga et al., 2022a). The main research question of this thesis is:

What conditions influence the success of shared car services in rural areas like North-East Drenthe?

In order to answer the main research question, the following sub questions are answered:

- Which factors influence the success of existing shared car services in rural areas?
- How can the practice of reflective learning be used to increase the effectiveness of pilots?
- How does the carsharing pilot Hondsrug Noord perform in terms of usage and user satisfaction, and does this differ from the ex-ante expectations?
- To what extent was the practice of reflective learning used in the pilot Hondsrug Noord?

1.3. Reading guide

The next chapter of this thesis delves into the relevant theoretical concepts of rural car sharing to come to a conceptual framework for understanding the relationship influencing rural car sharing. The third chapter discusses the methodology by presenting the research design. In the fourth chapter, the research results are shown, analysed and contextualised in relation to earlier studies into rural car sharing. Chapter 5 is the concluding chapter in which the research questions are answered. Additionally, this chapter reflects on the limitations of this research, gives suggestions for further research, gives recommendations for planning practice and a reflection on the research process itself.

2. Theoretical framework

2.1. Defining shared car services

2.1.1. What are shared car services?

With the emergence of new technologies like the smartphone, internet and big data alongside other structural societal and cultural changes the opportunity for shared mobility arises (Shaheen et al., 2018). Shared mobility is a transportation concept that encompasses a set of disruptive transportation systems which all share the possibility of trip planning, booking and real-time information (Soares et al., 2018). In practice shared mobility means the shared usage of vehicles like cars, bikes, scooters etc. It allows users to access a mode of transport for a short period of time when the user needs it without having to own that particular vehicle. This results in a shift from ownership of a vehicle towards service use which has positive consequences within the realm of sustainability as it reduces vehicle ownership, increases multimodality and in some instances reduces vehicle kilometres travelled (Soares et al., 2018). Simultaneously, the usage of a vehicle gets maximised which has positive environmental effects (CROW-KpVV, 2016). As pointed out before, several modes of shared mobility exist. Additionally, there is a variety in business cases and effects on travel behaviour. Although the focus of the research is on shared car services, other modes of shared mobility are also briefly discussed in the first section of this theoretical framework as they can be part of a multimodal travel movement and serve similar goals to shared car services and therefore complement each other.

2.1.2. Different types of shared car services

Shared mobility can be divided into three types of sharing: the sharing of a vehicle, the sharing of a ride and the sharing of a delivery. Shared car services are a type of ‘the sharing of a vehicle’ hence most focus is put on these types. Next to the type of sharing, there is also a distinction between who shares with whom. Again three types can be distinguished, namely business-to-consumer (B2C), consumer-to-consumer (C2C) and business-to-business (B2B) (Jorritsma et al., 2021).

Currently, three main types of vehicle sharing exist, these are carsharing, scooter sharing and bike sharing. Businesses who offer shared cars to consumers (B2C) give their users one of three options for their trips. The ‘round-trip’ is when the user of the shared car returns the car to the same place as where the trip started, therefore the cars have a fixed location when not being used. ‘One-way-station-based’ is the second option with which a user can either return the car to its original starting point but also finish the trip at another fixed end point. At this point another user can return the car to the original starting point as part of their trip. The third option is called ‘free-floating’ and means that the car has no fixed start or finish location. Nevertheless the car needs to be returned to a geographical bounded area, this usually is a city centre or zone decided by the shared car operator (Shaheen et al., 2018).

C2C sharing is sometimes considered the same as ride sharing. This is the result of a different usage of the concept in British and Northern American literature (Millard-Ball, 2005). Although this research does not include ride sharing when referring to C2C sharing, the concept does require some explanation as ride sharing can have its role in multimodal transport. With ride sharing a person shares a ride in their private car with another person. Four different types of ride sharing are present in the Netherlands (Jorritsma et al., 2021). With peer-to-peer sharing a person offers their car for rent on an online platform to another person who can use the car for a trip whilst an intermediary party connects provider and users and deals with the payment. The second option concerns local communities who collectively own a car, this is often done on street or neighbourhood level. The third type of ride sharing is B2B with which a company owns cars themselves that employees can use for business purposes. The final type of ride sharing is carpooling (Jorritsma et al., 2021). The idea is similar for scooter and bike sharing. These systems can be station based and therefore be ‘round-trip’ or ‘one-way-station-based’, or non-station based and therefore ‘free-floating’ or hybrid with which a scooter or bike trip can be started at one certain docking station, but can be ended without returning to a docking station at all.

2.1.3. Shared car services and accessibility

The different modes of shared transport can make for a new mode of travelling. Users can use it as their way to get to their destination or as part of a multimodal travel movement, as a way to reach new destinations or as a way to reach current destinations in a new way. Therefore, *ceteris paribus*, the accessibility of places should increase when new modes of transport are added to the current mix. However, simultaneously the accessibility of rural regions is under threat as public transport services become more limited in the regions (Székely & Novotny, 2022). This development has negative impacts on poverty and social exclusion in these regions as access to various activities and services becomes more limited (Székely & Novotny, 2022). In order to find out whether shared cars can help decrease the problems related with diminishing accessibility of rural areas, the accessibility of rural areas first needs more understanding, this will be done in the next paragraph.

2.2. Rural areas and accessibility

2.2.1. What are rural areas?

There are different understandings on when an area is to be considered as rural. All share in common that they are based upon criteria that set boundaries. The most used way is based upon population density. In the Netherlands, municipalities are categorised into five groups, the largest being over 2500 inhabitants per square kilometre, the smallest being below 500 inhabitants per square kilometre. Statistics Netherlands defines an area as rural when the population density is below 1000 inhabitants per square kilometre (CBS, 2021d). This definition of the rural is commonly used in research within the Dutch context, this research will do the same (Haartsen & Venhorst, 2010; Kamminga et al., 2022c). Setting this strict boundary does mean that an area with slightly more than 1000 inhabitants per square kilometre is considered urban whereas slightly below is considered rural. Nevertheless, the difference between these areas can be very small and therefore require similar types of policy. Simultaneously, areas that are both considered rural but differ by a large margin in population density might require different policies. Therefore, the United States government also makes use of the population size of places. A settlement in the United States is considered rural when the population size does not exceed 2500 inhabitants, whilst also making use of a population density criterium of 500 inhabitants or below per square mile (Ratcliffe et al., 2016). As the population density in the United States is generally lower and the distance between places is generally higher, the conception of when a place is accessible might also differ.

2.2.2. What is accessibility?

The concept of accessibility is a broad concept that is defined differently by different researchers. There is a consensus that there are several different types of accessibility, one of these categorizations being; transport availability and connectivity, communication, spatial, social, economic and physical accessibility (Antipova et al., 2020). Another categorization is by Van Wee et al. (2013) who differentiate accessibility into a land-use, transport, social and economic component. Based on this categorization they come to the following definition of accessibility: ‘‘the extent to which land use and transport systems enable (groups of) individuals to reach activities or destinations by means of a (combination of) transport mode(s).’’ (Van Wee et al, 2013, p.1). This definition highlights the linkage between a mode of transport and a desired destination. Car sharing offers the opportunity people to reach their desired location via a new mode of transport, consequently improving the accessibility of destinations. Biosca et al. define accessibility by focussing on the locational advantage a well-connected area has relative to other areas (2013). This is the result of a better connection to the transport system and therefore makes an area more productive and competitive as well as generally more attractive for people to live as the ease of reaching certain activities from a given place increases. This definition again highlights the interlinkage between a well-functioning, accessible transport system and the ability for people to reach their desired destination. Typically, rural areas are less accessible than urban areas as the distance to facilities and services is larger and transport options more sparse. The two trends both

favour urban areas in terms of accessibility which is further reinforced by the declining availability of public transport in the rural areas.

2.2.3. Problems concerning accessibility in rural areas

When areas are located further away from a regional centre, the risk of inhabitants facing social exclusion increases (Székely & Novotny, 2022). Generally, locations that are further away from a regional centre are less accessible (Pot, 2023). This relation is also found by Camarero and Oliva (2019) who found a strong link between rural wellbeing and social sustainability, and accessibility and mobility. So, when services in rural areas are well accessible the rural wellbeing and social sustainability increases. The most important or most frequently used services/facilities are generally the general practitioner, schools, supermarkets and work. Christiaanse (2020) found that there is no correlation between population decline and facility decline in depopulating rural areas in the Dutch context. Nevertheless, the amount of facilities in these rural areas has seen a decrease in for example the amount of general practitioners and supermarkets (Christiaanse, 2020). Therefore people need to travel further to reach these facilities. Simultaneously, the opportunity for vulnerable groups of people to reach the facilities elsewhere shrinks. This group includes children, students, elderly and disabled people who cannot afford or drive a private car. For them a good public transportation connection is necessary. However, the rural areas are the exact areas that have limited or even no connection to the public transport network (Velega et al., 2012). Therefore, the problem regarding accessibility in relation to this study can be summarised in a rather concise way: generally, inhabitants of the rural areas face more difficulties reaching their desired destination than urban inhabitants. This problem can be mitigated by rural inhabitants by making use of a car, it is therefore no surprise that car ownership in rural areas is higher than in urban areas (Wappelhorst et al., 2014). Nevertheless, not all people can for a variety of reasons own a car and therefore become dependent on public transport for their longer travels. Nonetheless, the provision of public transport has been declining in rural areas over the last few years. It has to be acknowledged that car sharing offers no solution for the mobility issues of children in rural areas as they cannot drive a car. However, car sharing could be of use for other vulnerable groups regarding mobility like students, elderly and people who do not own a private car. Using a shared car allows these people to reach their destination or make use of the service as part of a multimodal travel movement. This could mean that more people start using public transport as it becomes more accessible as parts of the trip can be made via shared car. However, Ciara & Becker (2017) found that one-way based and free floating shared car services at least partly compete with public transport and could therefore hinder the provision of public transport.

2.3. Successful shared car service schemes

2.3.1. The business model

The different business models of carsharing all have their own (dis)advantages and use characteristics. A number of studies have researched questions revolving around when a specific type of system is effective, why users do or do not prefer a specific set up given the circumstances and whether it makes for a viable business case. One of the first distinctions between the different business cases revolves around the length of trips. Round trips are usually longer in terms of distance than one-way-station-based or free-floating trips. (Alencar, 2019). Simultaneously, Becker et al. (2018) concludes that station based car sharing is most popular for regular trips for which a car is the most effective mode of transport whereas free-floating is mainly used for non-regular trips and as an alternative for public transport. Another distinction between the different modes lies in terms of pricing and the related scalability. Peer-to-peer car sharing has the highest scalability. Users use cars from other individuals, therefore there is no business that needs to purchase a fleet of cars which is the case with the B2C or B2B models (Meelen et al., 2019). Therefore the prices of trips are also, generally, lower. Additionally, P2P services are not affected by population density whereas B2C services are (Münzel et al., 2020). Nevertheless, the relationship between population density and the success of carsharing services is well established in academic literature (Nansubuga & Kowalkowski, 2021). Carsharing is more common in areas with low car ownership and good public transport connections; these are characteristics of urban areas, in which

carsharing serves as an alternative to public transport. Therefore, this could lead one to believe that P2P services have a higher chance of success in rural areas than B2C or B2B services.

2.3.2. Who uses shared cars?

The likelihood of someone's willingness and desire to use a shared car depends on socio-demographic, socio-economic and geographical factors (Nansubuga & Kowalkowski, 2021). Next to that, mobility patterns, family decisions, cost, convenience and quality of alternative modes of transport also play a role (Hahn et al., 2020). This does not mean that once a person ticks a number of boxes that person automatically will use a shared car, however there are common denominators between users of shared car services. Regarding socio-demographic age and gender are the most important factors (Shaheen and Martin, 2010). If one combines several socio-demographic factors, the average shared car user would be a young middle-class male who is highly educated and from a household of below average size (Becker et al., 2017). It is more common that a young highly educated person lives in an urban area than in a rural area. Therefore, the high representation of this socio-demographic group could be the reason for the higher chance of success in urban areas. However, this higher chance of success could also be the result of geographical factors.

Prieto et al. (2017) concludes that parking costs or limited parking spaces in urban areas contribute to the higher use and availability of shared cars. Additionally, availability of other modes of transport and close proximity to the shared cars also has a positive effect on carsharing (Münzel et al., 2020). Carsharing is also often linked with the reduction of greenhouse gases. When the shared cars are electric the symbolic value of the shared car as an environmentally friendly choice increases resulting in a higher market share (Kim et al., 2017). Nevertheless, users still do not see it as being as environmentally friendly as public transport (Münzel et al., 2020). One is therefore led to believe that environmentally friendly considerations do play a role in the decision of some users, but it is not the deciding factor for most users as they would otherwise have used public transport. There is no academic consensus on the socio-economic motives of users of shared cars. Whereas Duncan (2011) found that reducing costs is one of the motives for users, Hjortset and Böcker (2020) found that users are actually unconcerned about reducing their expenditure. Furthermore, having a higher income actually increases the likelihood of using shared cars (Jutschen et al. 2019).

2.3.3. Drivers and barriers for customers and providers

Although customers can have various reasons for making use of shared car services, there are also potential barriers and burdens that they perceive. These barriers are the burdens of ownership and sharing and access barriers (Nansubuga & Kowalkowski, 2021 & Hazée et al., 2017). Hazée et al. (2017) makes a further distinction between the functional and psychological access barriers. Functional barriers are service complexity, which refers to the fact that some people are unaware of how a carsharing system functions, or concerns regarding reliability of the product performance and its underlying technology. Psychological barriers refer to the perceived contamination and responsibility of usage. Perceived contamination means that people are reluctant of using a shared car as they think it might be polluted by previous users. Responsibility of usage means that users think that they can be held accountable for wrongdoings by other users. Additionally, trust is an important factor for shared car services. In P2P systems, a customer rents the car from another person, whereas in B2C systems a customer rents from a company. Hartl et al. (2018) found that users have more trust in a company as it is less risky and therefore prefer B2C services when it solely concerns the trust factor. These barriers can lead to a limited use of shared car services along with the first established and later often reconfirmed barrier, the limited availability of cars (Shaheen et al., 1998). Other barriers to carsharing are low public awareness or the fact someone has to reserve a car every time they want to use it (Zhou et al., 2017).

The main motivation for providers to offer shared cars is generally to make a profit, this is especially the case for B2B and B2C services (Perboli et al., 2018). Similarly, the main motivation in P2P services is for providers to make an extra income. Dill et al. (2019) also found that P2P providers can also have a low level of use of their own car as well as the willingness to help others as a motivation. Nevertheless,

whilst there are several motivations for providers, they do also face barriers. For B2C and B2B services, the initial fleet of cars has a high investment cost (Nansubuga & Kowalkowski, 2021). Next to that, vehicle balancing is a common challenge for providers, specifically when it is a one way scheme. The problem that emerges is that most trips go from one specific starting point to an end point, but not the other way around which therefore results in a clustering of cars at the end point. Therefore users can ultimately not make use of a shared car at the starting point as they all end up stationed at the end point. Mitigating this problem can be costly for providers and therefore creates a barrier. P2P services do not face these problems as they do not require the purchase of a fleet of cars and only allow for round trips. P2P does however face some other barriers. Whereas in B2B and B2C the provider only has to find customers, in P2P services the provider of the car has to be matched with a customer. Additionally, some potential P2P providers fear the risk of a limited access to their own car or damage to their car whilst it is rented out (Hazée et al., 2017).

2.3.4. Trend in usage of shared cars

B2B and B2C services are used by a different type of user. B2C services are generally used by people for leisure or shopping whilst B2B services are generally used for work related trips (Sioui et al., 2012). Therefore providers could offer the same car to a different group of users at different times, as work related trips are mostly made during workdays and leisure and shopping mostly during weekends. Jian et al. (2017) makes a further distinction based on income. High income groups generally use a shared car for leisure or business, whereas low income groups use shared cars when they are with large groups or when they are moving. Other commonly found effects of shared car usage is an increase in multimodality and a reduction of car ownership amongst users. This effect can be found in for example Germany in a study by Loose et al. (2006) or in Seoul, Korea where one shared car replaced 3.3 private cars (Ko et al., 2019).

Based on previous research as discussed above one can conclude that, generally, carsharing programs have a higher chance of success when population density increases. Next to that, carsharing is more prevalent in areas with good public transport systems and low car ownership. These factors are typically most prevalent in urban areas, it should therefore come as no surprise that almost all successful shared car schemes are present in urban areas. Nevertheless, some researchers have looked into the success of shared car systems in rural areas. The next chapter will discuss these researches and pilots, although not plentiful, in more detail to assess the feasibility of shared car services in areas with relatively lower population density, lower quality of public transport and a higher degree of car ownership.

2.4. Shared car services in rural areas

Jorritsma et al. (2021) concluded that the future of shared cars and shared mobility in general lays in the urban areas, however Jorritsma et al. (2023) have a more optimistic conclusion in that shared cars should also have a potential in rural areas, though in a different way than in urban areas. In rural areas shared cars should not be an alternative to public transport but an addition (Jorritsma, et al. 2023). This optimistic shift in position is hopeful and might be an example of an emerging positive view of carsharing in rural areas. Some academics have researched the possibility of shared cars in rural areas, nevertheless the body of literature is still not plentiful. A total of six studies has specifically looked into the feasibility and desirableness of shared cars in rural areas. Two of these studies have looked into cases where shared cars are actually driving (Shibayama et al., 2013; Wappelhorst et al., 2014), whereas three researches focus on whether inhabitants of specific rural areas are open to carsharing (Rotraris & Danielies, 2018; Schaefer et al., 2022; Silberer et al., 2022). The final study by Illgen and Hock (2018) makes a simulation on how urban shared car services can expand their coverage area into surrounding rural areas whilst remaining successful. Other researchers have studied similar subjects but for example have vastly different views on whether an area is to be considered rural (Higginbotham, 2000), focus on ride sharing instead of carsharing (Lygnerud & Nilsson, 2021) or focus on shared mobility in general with no specific focus on shared cars (Hult et al., 2021; Poltimäe et al., 2022).

2.4.1. Shared car riding in rural areas

The paper by Shibayama et al. (2013) researched the success of three electric shared cars that were placed for an indefinite duration in three small Austrian villages with between 600 and 1100 inhabitants. The cars were provided by the municipality in central locations of the villages and all costs were covered, in that regard it can be seen as a success. Users had two main motives for the usage of the shared cars. One was out of curiosity for electric cars or the sharing system, the other motive was that it replaced the user's second or even third car. Additionally, the villages are small, therefore people know one another which lowers the burden of sharing a car together. This finding is in line with Hazée et al. (2017) who found that psychological barriers (i.e. lack of trust) can be a limiting factor for carsharing. Most trips in this case were made during the day on weekdays with the main purpose being equally split between business and leisure. The cars were hardly used for commuting purposes. Shibayama et al. (2013) also looked into the relationship between shared cars and public transportation. The three villages are all small in terms of population size and also located relatively far away from urban centres. Therefore, public transportation provision is limited or even non-existent during evenings or weekends. The researchers found that some users during these times used the shared car as a replacement for a bus trip. This means that in areas with scarce public transport provision the shared car acts as a substitute and therefore to an extent competes, whilst it can also complement public transport during times that there is no provision at all (e.g. nights or weekends).

Contrary to the research by Shibayama et al. (2013), Wappelhorst et al. (2014) found their case not to be economically feasible. They researched a case in the touristic Southern German town Garmisch-Partenkirchen. This is a town with 26000 inhabitants located in a rural area where during a period of three months one shared car was placed. During this time 39 different users used the car, 23 of whom were local residents, the other users were tourists. In their research Wappelhorst et al. (2014) compared the Garmisch-Partenkirchen with the city of Berlin in terms of potential users and found that only 25 percent of Garmisch-Partenkirchen's inhabitants would be open to using shared cars whereas this is 80 percent in Berlin. This is attributed to the fact that 78 percent of Garmisch-Partenkirchen use their car on a daily basis whereas this is only 12 percent in Berlin, in other words car dependence is high which results in lower willingness towards carsharing. Nevertheless, Wappelhorst et al. (2014) do conclude that there is potential for carsharing in Garmisch-Partenkirchen even though it is currently not economically viable. It could become viable when the usage by tourists increases, nevertheless Wappelhorst et al. (2014) is not positive about the potential of carsharing in less touristic rural towns and areas.

2.4.2. Perception of rural inhabitants

The research by Silberer et al. (2022) looked into the acceptance and intention of shared car usage by residents of a Southern German municipality with 6600 inhabitants. Their findings shows that there are three significant factors that determine whether one wants to use a shared car in a rural area: performance expectancy, one's hedonic motivation and the facilitating conditions. Performance expectancy refers to whether one finds a shared car useful, whereas hedonic motivation refers to whether one likes the idea of a shared car in the first place. The facilitating conditions indicate whether one thinks they have the resources to make use of shared cars. This was found to be the least problematic factor in their survey as most people had trust in their own capabilities. Performance expectancy was found to be the most influential regarding intention of use. Silberer et al. (2022) acknowledge that this rating is low compared to other studies but is explained as the respondents do not see themselves as the target group of shared cars, but instead see it as an opportunity for elderly, tourists and business people. Additionally, the strong sense of community that is present amongst the respondents leads to a positive conclusion regarding the potential of shared cars in rural areas (Silberer et al., 2022).

Another research in Germany focussed on the rural municipality of Lohmar which has 31.000 inhabitants dispersed over 30 villages in the region (Schaefer et al., 2022). Performance expectancy was lower in Lohmar at 34% compared to the 43% of all Germans who found shared cars useful. Schaefer et al. (2022) link this to the feeling of respondents that services are less accessible when a shared car is

used. Additionally, distances between places are larger which historically leads to a higher car ownership and dependence. Nevertheless, 29% of Lohmar's inhabitants have the intention to use shared cars whereas this is 23% for all other Germans. The current pitfall however for Lohmar is the limited knowledge and awareness inhabitants have of shared car services. One out of every 4 Germans already has experience with shared car usage, whereas in Lohmar this is only 11%. It therefore seems that there is an opportunity for Lohmar as the intention of use is relatively high. Therefore, Schaefer et al. (2022) conclude that there is potential for shared cars in Lohmar once the municipality starts to educate their own inhabitants about the possible usage of shared cars more actively.

This finding is further supported by the study by Rotaris and Danielis (2018) who looked into the demand for shared car services in the rural region of Friuli Venezia Giulia, Italy. They found a non-negligible demand which could be increased when potential users become better informed. Next to that, they found young and environmentally conscious people to be the most likely users of shared cars. Within the studied region, the city of Trieste is a large urban centre where the potential demand is 6% of the population, in the wider area this is 4%. The difference is attributed to the more favourable conditions for carsharing in the city of Trieste. Although this number seems relatively low, Rotaris and Danielis (2018) conclude that is a high enough percentage to make for a successful shared car scheme.

The final paper by Illgen and Hock (2018) found that there is an opportunity for a reciprocal relationship between urban and rural areas when existing urban schemes are expanded into surrounding rural areas. In their research a simulation was made where an already existing urban car sharing scheme increased its service area into the adjacent rural areas. As demand in rural areas is lower than in urban areas, increased urban profits could outweigh losses made in the rural areas. Illgen and Hock (2018) found that if there would be no demand in rural areas, demand in urban areas would have to increase by 15% to cover the costs. However, as distances in rural areas are generally longer, usage time and therefore utilisation rates increase which can also compensate for lower demand. Therefore, they concluded that rural systems are feasible when current profitable systems are expanded into the surrounding rural areas (Illgen and Hock, 2018).

2.4.3. Potential of pilot Hondsrug-Noord

As discussed in the introduction, this thesis is part of a pilot in shared cars in a rural area called the Hondsrug. The research area is further described in the methodology chapter, whilst the data on actual usage and satisfaction is presented and analysed in the analysis chapter. However, before the pilot was started a survey (N=228) was held amongst inhabitants of the Hondsrug area regarding their views on the pilot and their experiences and expected usage of shared cars (Kamminga et al., 2022c). The findings of this ex-ante research are similar to other pilots and researches in other rural contexts. 91% of the households in the sample own a car which is 16% higher than Dutch national average, whilst car usage is also higher and public transportation usage is lower. This is in line with previous researches who found that car ownership is generally higher in rural areas (Wappelhorst et al. 2014), but also that carsharing is more common in areas with lower car ownership rates (Nansubuga & Kowalkowski, 2021).

81% of the respondents are positive regarding the pilot and see shared cars as a potential replacement for a second car, which was also found by Shibayama et al. (2013) to be the main motive. Another important motive is the positive environmental benefits, which was also already concluded by Kim et al. (2017) and Rotaris and Danielis (2018). 80% of the respondents who are positive about carsharing are highly educated which is 5% higher than their share in the sample, therefore confirming the finding by Becker et al. (2017) that highly educated people are more open towards carsharing. The main motives for people to not make use of a shared car were found to be owning a car already, not having a shared car close enough to home, concerns regarding availability when needed and not knowing how carsharing works.

Regarding actual usage, numbers are again relatively high. 12% have used a shared car before, whereas 42% percent have used a mode of shared mobility in general. Jorritsma et al. (2021) found that only 5% of all Dutch rural inhabitants have ever used a shared car. Therefore, the survey respondents are

relatively experienced when it comes to carsharing. Additionally, men are more experienced with carsharing accounting for 75% of the users. This is in line with Becker et al. (2017) who found that men are more likely to use shared car services. However, the pilot found no link between previous usage and educational level which is in contrast with Becker et al. (2017), who concluded that usage and educational level have a positive relationship.

Regarding expected usage, 66% of the respondents see themselves using the shared cars at least once a year. Half of these people even expect to use it more than once a month. Most people will use the shared car for leisure purposes, these activities are incidental and include for example visiting friends/family or weekend trips. Only one quarter of the respondents see the shared car as an opportunity to commute. This is in line with previous research which found that B2C schemes are more often used for leisure purposes whereas B2B schemes are more often used for business purposes (Sioui et al., 2012). Respondents in the pilot show no clear preference for one of three options for returning the shared car. The majority intended to use the shared car regardless of the returning option. Nevertheless there is a slight preference for the one-way-station-based option.

One of the key objectives for providers should be to offer their shared cars for a low enough price. 85% Respondents say that it is (highly) important to them that the costs for using a shared car do not exceed the costs of owning a private car, whereas 66% want it to be cheaper than public transport as well. Additionally, only 21% percent of the respondents would be willing to use a shared car if the costs would be higher than using their private car. In their final conclusion, Kamminga et al. (2022c) conclude that the ease/possibility to reserve is the most determining factor deciding whether people want to use a shared car. Other important factors are having the shared car close to home, costs being lower than a private car or public transport, cleanliness and the car being electric.

2.5. Reflective learning

Evaluation is an essential part in the process of developing policy. It helps policy makers assess whether chosen policy measures are effective and suitable. Often, this is done before (ex-ante) or after a project or policy has been carried out or established (ex-post). Ex-post evaluation is not always a suitable way of evaluating as it requires clear policy goals that can be tested in a straightforward manner. Therefore, a clear pathway on how to achieve these goals is required, which is not the case in complex policy situations (Verwoerd et al., 2020). In complex situations, like the pilot Hondsrug Noord, clear policy goals cannot be formed explicitly, instead it is often preferred to work with ambitions. Policies therefore have a more experiential character as in a complex situation many factors influence the outcome, therefore it is not yet explicitly clear how to reach the desired goals. In these situations, where learning is a crucial part of policy developing and the implementation process, one should opt for the strategy of reflective learning (Verwoerd et al., 2020).

Reflective learning entails the process in which policy researchers work together with stakeholders jointly learning from the experiences the new policy brings and using these experiences to learn from and improve the relevant policy (Verwoerd et al., 2020). Verwest et al. (2019) emphasise that reflective learning is the process of learning how to implement policy in complex situations successfully. Van Veen et al. (2016) highlight that stakeholders can use the extra gained knowledge from the evaluation directly and therefore immediately improve their policy whilst it is being implemented instead of only afterwards. Kamminga et al. (2022a) emphasise that reflective learning contributes to policy evaluation by co-creation of knowledge in regular meetings between evaluators and involved parties. The commonalities between these definitions show that reflective learning is about learning from experiences in the policy development process and not merely afterwards. Additionally, the active involvement of stakeholders in the evaluation process is key to a successful reflective learning strategy. These characteristics make reflective learning a different evaluation strategy from experiential learning. Both reflective and experiential learning have in common that they start with an experience, in the regard of this thesis this would refer to engaging in a carsharing pilot. Whereas experiential learning would only have a carsharing project and experience how this project unfolds, reflective learning adds a second

stage after the experimental phase in which interventions are made (Boot and Boxer, 1980). These interventions are made in order to make an ongoing project or pilot more successful whilst it is running.

Several renowned scholars have designed models to capture the process of reflective learning and its accompanying steps (Kolb, 1984 and Gibbs, 1988). Kolb's model consists of four steps that have an iterative character. The steps are concrete experience, reflective observation, abstract conceptualism and active experimentation (Kolb, 1984). In the case of a car sharing pilot, concrete experience would mean that the cars are made available to the public after which people can start to use the cars. Reflective observation means that the stakeholders monitor the usage and try to decipher patterns in usage when they are available. Abstract conceptualism means that reflections made in the previous stages are translated into potential changes to the pilot. In the final stage of the model, the active experimentation stage, changes are put into practice. The model then moves towards the concrete experience stage again, hence the model has an iterative character (Kolb, 1984).

The model by Gibbs (1988) has six steps: description, feelings, evaluation, analysis, conclusion and action plan. Whereas Kolb's model can be implemented in scenarios with multiple actors, Gibbs model is better suited for scenarios in which one wants to reflect on their own actions as it involves reflection on one's feelings that accompany an experience. It is nevertheless important to realise that there is more than one model within the realm of reflective learning. Rodgers (2002) gives four criteria that a successful reflective learning process should include. The first criteria entails the 'meaning making' of the reflection process. By making sense of an experience the observer learns, which allows for deeper understanding of the next experience. The second criteria explains that reflective learning is a systematic and disciplined way of thinking. The third criteria explains that reflection needs to happen in a community by having interaction about the experience with others. The fourth criteria discusses the attitude participants of the selection process should have, they should be open to learn which opens the opportunity to learn from the experience (Rodgers, 2002).

It becomes clear that one does not solely learn from an experience itself, but that this mainly depends on what one does with an experience. One can choose to learn from an experience but this is an active process. Simply experiencing does not automatically lead to new knowledge or better policy. One needs to have multiple moments during a project at which intermediate outcomes and observations are reflected upon. This means that the process has an iterative character. Based on the model by Kolb (1984), this research will use four steps that allow for comprehensive application of the process of reflective learning. These four steps are labelled: Action, Observation, Reflection, Revise plan. These steps show overlap with the steps by Kolb (1984). Action means that cars are made available to the public who can use them in their preferred way. This is observed by the stakeholders, additionally patterns in usage are deciphered. In the reflection stage, stakeholders come together to reflect and give meaning to the observations. Based on these reflections changes can be made to the setup of the pilot. These steps show resemblance with the criteria of Rodgers (2002). Learning is done in a systematic way as during each meeting the same topics will be reflected on. The topics are based on variables that previous research deemed to be imperative for successful car sharing schemes and can be altered by the stakeholders. Finally it is important to note that for this process to work, reflection and interaction between stakeholders does not only take place during the meetings. Active and continuous interaction between evaluators and stakeholders is required so that the reflection process during meetings becomes more valuable (Edelenbos and Van Buuren, 2005). This entails linking back intermediate findings on a frequent basis and active monitoring to give input to the evaluation (Van Veen et al., 2016).

2.6. Conceptual model

Figure 2 on the next page shows the schematic overview of interlinkages as found in car sharing literature and literature on the process of reflective learning. Car sharing in the rural context is depicted in the box in the middle of the model. The process of reflective learning and how it is interlinked with car sharing is shown by the dotted lines.

The model shows that in rural areas several factors are existing that lead to a limited accessibility: these factors are high car dependence, relatively long distances, poor public transport connections and poor connection to facilities (Christiaanse, 2020; Székely & Novotny, 2022; Velega et al., 2012; Wappelhorst et al., 2014). Car sharing can offer an opportunity to mitigate this limited accessibility.

The literature review has distinguished several factors that influence whether car sharing is successful or not. These factors are shown in the two separate boxes: the ‘‘imperative conditions of successful car sharing scheme’’ box and the ‘‘demographic factors’’ and ‘‘other factors’’ box. Although all these factors influence whether a rural car sharing scheme should be considered successful, only the factors in the ‘‘imperative conditions of successful car sharing scheme’’ box can be altered by the organisers of a car sharing pilot. These conditions are explained individually in more detail later on in the chapter.

The organisers of a car sharing scheme need information throughout the duration of the pilot to assess whether alterations should be made to the factors in the ‘‘imperative conditions of successful car sharing scheme’’ box. To assess whether these changes are needed, organisers should look at the factors in the ‘‘measurable variables on shared car usage’’ box. When the pilot is doing well, for instance the number of trips per location and user satisfaction are high, no alterations to the imperative conditions are needed. However, in the case that the measurable variables show unsatisfactory results, the organisers could make alterations to the imperative conditions, by for instance changing the price setting or changing the return option of the car. All five imperative conditions are discussed in more detail in the following paragraph.

Organisers can opt for two types of business models, B2C and P2P. The latter has the advantage that they are not influenced by population density and do not need the initial purchase of a fleet of cars. B2C services have the advantage that they are not dependent on the willingness of citizens to share their own car (Meelen et al., 2019; Münzel et al., 2020). For the majority of people the price per kilometre of a shared car needs to be lower than the price per kilometre of their private car or public transport (Kamminga et al., 2022c). Organisers should also consider their strategy for creating awareness for their shared cars. This can be done in an active way via (social-)media channels, papers or by offering free trials, or in a passive way by hoping that word-of-mouth advertising is sufficient. Three return options are common for shared cars, these are: the round-trip, one-way-station-based, free floating return option. Kamminga et al. (2022c) found that potential users of the pilot Hondsrug-Noord cars had a slight preference for the one-way-station-based returning option. Finally, good public transportation in rural areas is of importance for users to be able to reach the shared cars, this is referred to as first and last mile connectivity and in doing so allows more people to reach and use shared cars which are for instance located at hubs (Shaheen & Chan, 2016).

When the organisers succeed in creating a successful set up for rural car sharing, the positive effects of car sharing become visible for society. The positive effects of car sharing are depicted in the box at the bottom of figure 2 and are the improvement of rural wellbeing, a decrease in relative distances and a more environmental way of transportation than conventional private car transport (Camarero and Oliva, 2019; CROW-KpVV, 2016). Additionally, a line is drawn from this box to the ‘‘lessens the impact of...’’ box, as the positive effects have direct consequences on the existing limited accessibility of rural areas.

However, the scope of this research does not allow for direct conclusions on whether the positive effects of rural car sharing are attained. This can only be measured indirectly. If the rural car sharing pilot is doing well, one can assume that the positive effects emerge. This research primarily focusses on what

conditions are needed to create a successful rural car sharing scheme in the first place, therefore the measured variables, as discussed earlier, are shown in the ‘measurable variables on shared car usage’ box. This box is where the process of reflective learning and rural car sharing meet. The steps of reflective learning are depicted by the dotted lines in figure 2 and were earlier discussed in more detail in chapter 2.5.

The literature review above shows that reflective learning consists of several iterative stages (Edelenbos and Van Buuren, 2005; Kolb, 1984; Rodgers, 2002; Van Veen et al., 2016). In this research these are labelled as the action, observing, reflecting and revising stage. The initial setup of the pilot is put into action and contains a combination of deliberations on the business model, the price setting, the strategy to create public awareness, the allowed return option and the provision of public transport near the shared cars. That is why there is a dotted line flowing from the imperative conditions box to the action box. This results in a certain number of kilometres and trips for each car and results on user characteristics (i.e. demographics) and user satisfaction, hence there is a dotted line flowing from the action box towards the measurable variables box. Organisers can measure and observe the outcomes throughout the pilot and reflect upon these outcomes during periodic reflection sessions. Based on the reflections, the set up can be revised when this is deemed to be necessary. This is done by making alterations to one or more of the imperative conditions, hence there is a line flowing from revise plan to the imperative conditions box. These changes are then put into action again after which the process of reflective learning starts over again.

When the process of reflective learning is applied to a pilot study on car sharing, the effectiveness and learning potential of the pilot increases. In conventional pilots where the process of reflective learning is not adopted learning starts afterwards. Therefore, well thought out interventions cannot be made which limits the learning capacity. With the process of reflective learning, these thought out interventions can be made which improves the learning capacity of the car sharing pilot and the experience for users. As the process of reflective learning is an ongoing process, adjustments to the pilot can be made numerous times, which means that the pilot can also improve more than once. Knowledge on how these adjustments have an impact on the usage and satisfaction of users, offer valuable insights into the conditions that influence car sharing in rural areas.

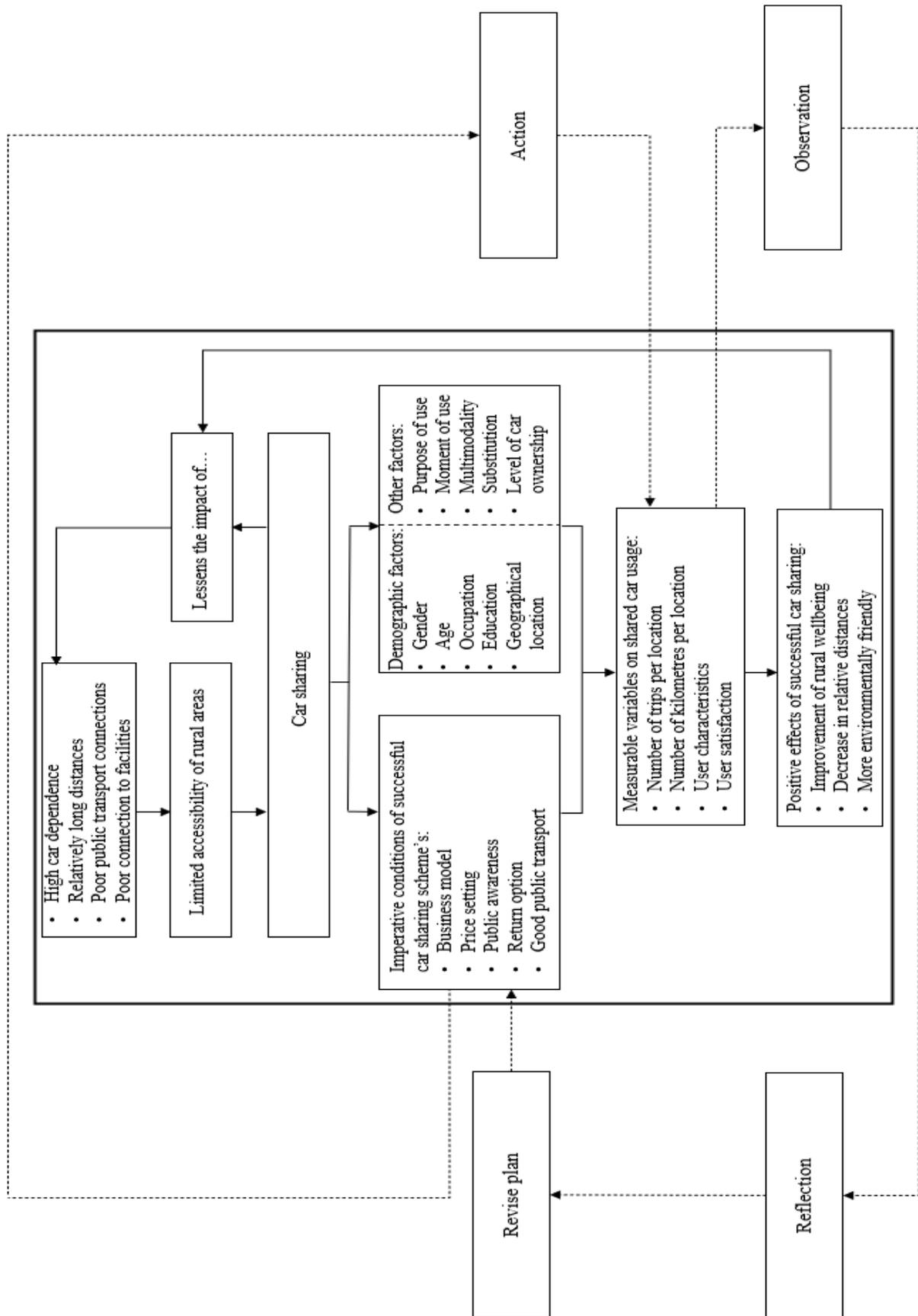


Figure 2. The process of reflective learning when studying the impact of rural car sharing (Author, 2023).

3. Methodology

3.1. Research design

In order to study the impact of carsharing on the rural mobility structure, a case study research design is opted. A case study is 'an empirical inquiry that investigates a contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident' (Yin, 2009, P.18). This means that a case study is used when you want to understand real life problems in depth, whilst the success potential is highly dependent on the context. The usage of carsharing in rural areas is dependent on a number of factors which can be seen in figure 2. Additionally, wider societal developments like fluctuating petrol prices or the Covid-19 pandemic of the last few years could also influence car sharing usage (Kamminga et al., 2022a). Previous research even concluded that there is a link between population density and the success of car sharing (Nansubuga & Kowalkowski, 2021). The population density in the research area is relatively low which could have consequences for the success of car sharing. In other words, the context in which carsharing is implemented might heavily influence its success. Therefore, a case study design is deemed to be the most suitable research strategy.

Generally, a case study research approach is accompanied by a qualitative research design (Clifford et al., 2010). However, in this research both quantitative and qualitative methods are used, leading to a mixed methods approach. At this point in time little is known about the true potential of rural carsharing, as was also concluded in chapter 2. It has to be assessed whether actual demand matches the promising potential demand as found by Kamminga et al. (2022c). Assessing the actual demand can best be done via quantitative research using several factors which are shown in table 2. Additionally, the qualitative part consists of observations on the process of reflective learning, the extent to which this practice was implemented successfully and to what extent the process helped to improve the results of the pilot Hondsrug-Noord. The chosen setup regarding reflective learning is discussed in more detail in chapter 3.4. Successful implementation should increase the effectiveness of the pilot, therefore a qualitative assessment via observation could increase the success of the pilot and reflection on the pilot.

3.2. Case study and Pilot Hondsrug Noord

In this case study the rural carsharing pilot Hondsrug Noord is researched. The pilot is a collaboration of the Province of Drenthe, Regio Groningen-Assen and the shared car provider. The university of Groningen was asked to evaluate the pilot, this thesis is one of the evaluating documents. Additionally, the researcher did an internship at the province of Drenthe. This resulted in a double role during the meetings in which the researcher not only observed the process, but also actively contributed to improving the setup of the pilot.

The pilot officially started in September 2022 with the placement of the first shared car at the P+R hub in Gieten. In the following months more cars would be added in village centres or at P+R hubs outside villages near main roads; the locations can be seen in figure 1. Opting for two different types of locations was a conscious choice as it could potentially give insight into whether users prefer village centres or P+R hubs as the location of the shared cars. At first a total of 13 cars would be placed at 13 different locations. However as result of missing charging infrastructure at some locations, some cars were not placed. In the summer of 2023 a car was available in the villages of Gieten, Annen, Eelde, Zuidlaren and Hoogezand. In the autumn of 2023 a car also became available in Haren. Tynaarlo, Gasselte and Paterswolde are places where a car was placed in early 2024.

The pilot has a duration of two years after which the involved parties will decide upon its continuation. If the pilot is a success, more cars could be added to the current locations or more locations could be provided with a car. In order to maximise the success of the pilot an ex-ante research was done by Kamminga et al. (2022b). This research concluded that there was enough potential demand in the region

and gave green light for the pilot to start. This thesis encompasses the ex-durante research on how the pilot is doing and therefore focuses on different aspects than the ex-ante research (Kamminga et al., 2022b,c). The ex-ante research focussed on how people view carsharing, how people view pilot projects, their previous experience with carsharing and expected usage (Kamminga et al., 2022c). This research mainly focuses on how people use the shared cars by analysing which trips were made. Additionally, the experience of the users is analysed and an analysis of the sociodemographic characteristics of the users is made. This is described in more detail in chapter 3.5.

The province of Drenthe, Regio Groningen-Assen and the University of Groningen set goals that they want to reach with the pilot. These goals were stated in the monitoring framework (Kamminga et al., 2022a) and are based on the mobility program 2021-2030 of the province of Drenthe. The goals are (Kamminga et al., 2022a):

- Increasing the usage of carsharing in rural areas by different target groups and research what is needed to attract them.
- Design an exploitation model that incentivizes people as much as possible to start using car sharing in rural areas. This encompasses variables relating to supply like different subscription methods, prices, and locations. As well as differing organisation structures, communication strategies and financial means.
- Increasing the current mobility supply and in doing so improving the rural accessibility.
- Attributing to sustainable mobility.
- Attributing to social inclusion.

This research will assess whether the first and second goal are accomplished in the first year of the pilot Hondsrug Noord. This means that quantitative data collection on car usage is only included up until October 2023. This data is collected by the shared car provider, analysed by the researcher and allows for conclusions on the first goal. Additionally, a survey on user satisfaction is distributed amongst all 175 people who signed up to use a car, regardless of whether they actually used a shared car. This survey was distributed in November 2023 and gives insights into satisfaction of users and what is needed to attract potential users, see appendix 7.1 for the survey. The second goal is assessed in a qualitative way using the strategy of reflective learning. It is assessed whether changes to the setup of the pilot lead to improved results and a sustainable exploitation model. However, decisions to make changes to the setup of the pilot could be based on the quantitative analysis as well. The scope of this research does not allow for direct conclusion on the effect of the pilot Hondsrug Noord on rural accessibility, sustainable mobility and social inclusion. However, as can be seen in figure 2 car sharing is known to contribute to these things. Nevertheless, the data analysed in this research does not allow for direct conclusions on the third, fourth and fifth goal.

3.3. Research area Hondsrug Noord

The research area of this research is located along the Northern part of a geographical sand ridge in the Dutch province of Drenthe, called the Hondsrug. This area is considered to be a rural area as population density lies below 1000 inhabitants per square kilometre (CBS, 2021d). In chapter 2 it was concluded that young males who are highly educated have the highest likelihood of using a shared car, based on their socio-demographic characteristics (Becker et al., 2017). Therefore, it is relevant to look at the socio-demographic characteristics of the municipalities that are part of the research area. The results can be seen in table 1 and are on municipal level as some of the data is not available on village specific level. The municipality of Groningen with its shared car in the village of Haren is an outlier compared to the other municipalities which is explained as the urban core of Groningen is also part of the municipality. This is an area where many young, highly educated people live and car ownership is low. Car ownership is also included in table 1 as Nansubuga & Kowalkowski (2021) found that car sharing is more common in areas with low car ownership. Car ownership in the research area is higher than Dutch national average, which indicates unfavourable conditions for the introduction of car sharing. Another difference can be found in age dispersion as the percentage of inhabitants age 25-45 is relatively low in the research area. However, there are no major differences in both education level (with the exception of Hoogeveen)

and male-female ratio between the research area and Dutch national average. Therefore, one has to conclude that the research area and its population do not perfectly fit into the most common user type as described by Becker et al. (2017), however both the education level and male-female ratio in the research area offer hope.

Municipality	Village(s)	Males per 100 females	Percentage 25-45 years	Highly educated	Cars per household
Assen	Gieten, Annen, Gasselte, Grolloo	100	18%	35%	1,3
Borger-Odoorn	Borger	100	19%	33%	1,3
Groningen	Haren	99	30%	47%	0,5
Midden-Groningen	Hoogezand	101	22%	22%	1,2
Tynaarlo	Westlaren, Zuidlaren, Vries, Tynaarlo, Eelde, Paterswolde	97	19%	44%	1,3
The Netherlands	-	99	25,3	37%	1,0

Table 1. Influential demographics predicting carsharing use of the municipalities in the research area (CBS, 2020a; CBS, 2020b; CBS, 2022; CBS, 2023; Compendium voor de leefomgeving, 2023).

3.4. Reflective learning and Pilot Hondsrug Noord

The process of reflective learning is used in the pilot Hondsrug Noord. How this process can be used to increase the effectiveness of pilots was discussed earlier in chapters 2.5 and 2.6. For this pilot it was decided that every half year a formal meeting is held in which all stakeholders participate in the evaluation (Kamminga et al., 2022a). The stakeholders involved are representatives of the Province of Drenthe, Regio Groningen-Assen and the car provider. Meeting too often is not useful as the pilot needs time to develop, i.e. changes to the setup of the pilot need time to be implemented, noticed by users and potentially influence users demand and satisfaction. However, meeting too infrequently means that monitoring and evaluation is not done closely enough which decreases the learning potential of the pilot. Therefore, meeting every half year was chosen to be the best middle way (Kamminga et al., 2022a).

Next to the half yearly formal meeting, stakeholders can also decide to meet more often during informal meetings. As little is known about car sharing in rural areas, it is unknown whether certain locations turn out to be more successful than others. Therefore, it is thinkable that changes need to be made more often than every half year (Kamminga et al., 2022b). Additionally, the car provider has permission of the other stakeholders to make adjustments to the setup when a certain situation demands for direct action that cannot wait till a formal or informal meeting. This could for instance result in changes to the locations, number of cars per location or pricing. Waiting half a year to discuss these changes during the formal meetings can be too long of a timespan in the complex real-life context that this pilot takes place in. Sometimes changes need to be made more often or swiftly, the shared car provider has permission of the other stakeholders to do so, granting that the shared car provider informs the stakeholders about the changes (Kamminga et al., 2022a).

At the start of the pilot it was expected that the pilot would last for a period of two years. However, during the summer of 2023 it was decided by the shared car provider that the pilot had to be paused due to abundant abuse of the cars. Neither the researcher nor the other stakeholders expected this situation

to occur. Additionally, no plans were made prior to the start of the pilot on how to deal with potential setbacks like these.

This situation had implications for the completion date of this research. In the case of a car sharing pilot, potential users need time to actually use the shared cars. Additionally, it is valuable to monitor potential changes in user behaviour over a longer period of time. The period of on average three months per car before the unforeseen break during the summer of 2023 was too short to get a comprehensive idea on how users used the shared cars. Therefore, the researcher decided in mutual agreement with the colleagues at the province of Drenthe and the thesis supervisor that the data collection had to take place up until early October 2023. This allowed for usage of the shared car by users in the months of July, August and September 2023 and consequently for a longer period of data collection and a better understanding of usage. Unfortunately, this also meant that the completion of this thesis was delayed.

The implications for the setup of the formal and informal meetings of this unforeseen break are discussed in chapter 4.4. Additionally, chapter 4.4 gives an overview of the changes made to the setup of the pilot as a result of the observation and evaluation regarding usage and satisfaction per meeting. This is done by structuring every meeting along the following alterable variables: price, location, number of cars, return location, awareness strategy (Kamminga et al., 2022b). These variables are chosen as they are factors that the stakeholders can still influence after the pilot is started. By making specific changes to these variables, usage could be steered in a positive direction.

3.5. Data collection and analysis strategy

In this research, three different types of data are used, these are: a literature study, the trip data of the shared cars and a survey that was distributed amongst every person who signed up to use a shared car. The literature review focuses on the success factors of shared cars in existing rural car sharing schemes and is used to answer the first sub question. The survey, which was distributed amongst people who signed up to use the shared cars of the pilot Hondsrug Noord, gathers data on user satisfaction. The factors included in the survey are discussed later on in this chapter and are chosen as they were determined to be influential factors on user satisfaction in earlier academic studies. The trip data is provided by the shared car provider and gives insights into how people use the shared cars.

The decision to choose for the analysed variables is not only because of their proven academic relevance. This research is part of several researches into the car sharing pilot Hondsrug Noord. The previous researches (Kamminga et al., 2022a,c) have influenced the direction and scope of this research by determining which factors should be analysed in this ex-durante research. However, these researches left room to add or subtract variables when deemed appropriate for this research. Therefore, one additional variable was added as the literature review pointed this out to be relevant. This is the multimodality of trips, which according to Soares et al. (2018) and Loose et al. (2006) increases when people use shared cars. All the other variables are discussed below and were determined by Kamminga et al. (2022a) and Kamminga et al. (2022c) to be relevant for the ex-durante research.

The trip data gives insight into the number of trips and its distances. These will be analysed as totals, per car and whether differences can be found based on their location at a hub or village centre. Secondly, a ranking will be made on how many trips each user has made to gain insight into whether users are recurring or one-off users. Additionally, the trip data can give insights into when the cars are used, which days of the week are more popular and during what time of the day. Finally, all trips are made visible on flowmaps (per car), which show all the destinations per car, these flowmaps can be found in chapter 7.5 and are discussed in more detail in chapter 4.2.

The survey was distributed amongst all 175 people who signed up to make use of the shared cars up until early October 2023 and gives insight into user satisfaction amongst other things. The survey was filled out by 34 respondents and has two ‘‘paths’’ (see chapter 7.1). One path for people who have used the shared car (N=14), one path for people who have not used the car (N=20). People who have used the shared car can give their opinion on variables like pricing or cleanliness, people who did not use the

car have no experience with the pricing or cleanliness of the cars, therefore questions on these variables are excluded. People who did not use a car are for example asked what changes they would like to see to the setup that would result in them using the shared cars. An overview of all the survey factors present in the analysis can be found in table 2 on the next page. In the analysis numerous charts and tables on all the variables are depicted, analysed and discussed in their relation to findings by earlier researches, specifically to the ex-ante research (Kamminga et al., 2022c). Specific attention is given to the ex-ante research as this research contained question of the same nature. For instance, the ex-ante research asked for what purpose people expected to use the shared car, this research asked for what purpose people actually used the shared car. Additionally, the ex-ante research had a higher number of respondents (N=228) and some overlapping question with this research. Also using the ex-ante research results for these questions leads to a higher number of responses than only using the responses of this research survey and therefore to more evident conclusions.

The demographic characteristics of users and non-users are compared via a series of chi-square tests of independence to find out whether there are significant differences between users and non-users in terms of their academic background. In these tests, usage (yes,no) is the dependent variable, and gender, education level and occupation are the independent variables. Age is also tested on its statistical relevance, but as this is a ratio variable, a chi square test of independence is unsuitable. Therefore a Kruskal Wallis test is performed for age in which usage (yes,no) is the dependent variable and age is the independent variable. It has to be noted explicitly that these non-users are not the general public who have not used a shared car but people who have signed up to use a shared car but have not (yet) done so. Finally, familiarity with the shared cars and preferred parking location are also tested on their statistical relevance as these are two variables for which it is known whether people have or have not used the shared cars.

Variable	User	Non-user	Question in survey:	In results chapter:
Actual usage of the shared cars				4.2.
Which car used	✓		Q2	4.2.
How often used	✓		Q3	4.2.
Purpose of use	✓		Q4	4.2.
Why not used		✓	Q20	4.2.
Questionnaire results				4.3.
Overall	✓		Q7	4.3.3.
Pricing	✓		Q9	4.3.2.
Reservation process	✓		Q11	4.3.2
Accessibility	✓		Q13	4.3.2.
Cleanliness	✓		Q15	4.3.2.
Gender	✓	✓	Q25	4.3.1.
Age	✓	✓	Q26	4.3.1.
Postal code	✓	✓	Q27	4.3.1.
Occupation	✓	✓	Q28	4.3.1.
Education level	✓	✓	Q29	4.3.1.
Substitution	✓		Q5	4.3.3.
Multimodality	✓		Q6	4.3.3.
Use again in the future	✓		Q17	4.3.3.
Recommendation to others	✓		Q19	4.3.3.
Desired changes		✓	Q21	4.3.3.
Familiarity with the cars	✓	✓	Q22	4.3.3.
Parking location	✓	✓	Q23	4.3.3.

Table 2. Variables in the survey and results (Author, 2023).

4. Results

4.1. Introduction

The following chapter outlines the results of the survey and data on the usage in detail. Chapter 4.2 covers the most important findings based on the trip data that is provided by the shared car provider to the researcher, chapter 4.3 covers the most important findings from the questionnaire and chapter 4.4 reflects on the effectiveness of the process of reflective learning in the car sharing pilot Hondsrug Noord. Results are visualised in text via several figures and tables. Some findings are not accompanied by a specific within text figure or table. For these findings visualisations can be found in the appendixes 7.2 to 7.6.

Throughout this chapter, when applicable and useful, findings are contextualised by comparing the findings to earlier studies into rural car sharing. Additionally, specific attention is given to the ex-ante research by Kamminga et al. (2022c) who asked some of the same questions during the ex-ante research but had a larger number of respondents to the questions (generally $N < 200$ per question). This makes the findings specifically interesting as a larger N generally means that results can be interpreted with more confidence.

4.2. Actual usage of the shared cars

Table 3 gives an overview on trip data per location and totals. A total of 58 trips were made, most trips were made with the car in Gieten whereas the car in Zuidlaren was never used. One factor that influences the amount of trips is the longevity of their availability, which can also be seen in table 3. The car in Gieten was the first car that was placed, therefore one could argue that it has had the most time to be used. This is partially true. In December 2023, a car was available in Gieten, Eelde, Hoogezand, Annen and Haren. Haren became available after data collection was finished hence it is not included in this result section. The car in Zuidlaren was not placed back after the pilot was paused, as it had never been used before this pause. Looking at the availability of the cars before the pause one can see that Gieten was available for use for a period of around five and a half months. Hoogezand was available for around 3 months whereas Eelde was only available for around one and a half months. Therefore, despite the fact that absolute usage numbers of Gieten are the highest, when availability of cars is taken into account Eelde performs best as usage has been relatively highest for the time the car was available. The cars in Eelde and to a lesser extent in Hoogezand were doing specifically well in the few weeks/month after they became available. In the following months, usage of the car in Gieten stagnated, such conclusions cannot be drawn for Eelde due to the absence of longevity of the availability of the cars. Several possible explanations could be thought of to explain the decrease in usage after a number of weeks. Marketing for the new locations of the cars via for instance social media or (local)-newspapers only happened actively in the week surrounding the placement of the car, not in the following weeks. Therefore it might be that a lack of marketing leads to a decrease in usage. Another explanation might be that some users are merely interested in using the car once out of curiosity, after they have done so they never had the intention of using the car again. Table 3 shows that trip distance in Eelde is relatively short compared to the other locations. The trips in Eelde are shorter since the destination of (most) of the trips is close to Eelde. This is made visible on a number of flowmaps that can be found in appendix 7.5. The flowmap of Eelde shows that most trips were made to neighbouring villages or to the city of Groningen. Groningen is also a popular destination for the other locations, however, as Eelde is located closer to Groningen than other villages, a high trip frequency to Groningen decreases average kilometres per trip for Eelde the most.

Average kilometres per trip is roughly the same for Gieten, Hoogezand and Annen. A pattern is visible in which roughly half of the trips from these villages are made to a neighbouring village. The other half of the trips have an urban centre as its destination. For Gieten there are two urban cores, namely Groningen and Assen, whereas Hoogezand and Annen only have Groningen as an urban core of common destination. Another interesting destination with the car in Hoogezand is Bunde, Germany. This is a relatively long trip that was made three times by the same person with the purpose of grocery shopping.

These trips raise the average kilometres per trip of Hoogezand. Finally, it is worth noting that the flow maps show that trips are often not made directly between starting location and destination, but have intermediate destinations, this is especially visible on the flowmap of Hoogezand.

Location	Number of trips	Number of kilometres	Average kilometres per trip	Hub or village centre	Car at location between
Gieten	27	1536	56,9	Hub	27-10-22 till 13-04-23 & 06-07 till now
Eelde	15	253	16,9	Centre	25-11-22 till 21-12-22 & 20-01-23 till 02-02-23 & 14-07-23 till now
Hoogezand	12	738	61,5	Hub	16-12-22 till 20-03-23 & 06-07-23 till now
Annen	4	236	59	Centre	20-01-23 till 04-04-23 & 14-07-23 till now
Zuidlaren	0	0	0	Centre	02-03-23 till 01-06-23
Total	58	2763	47,6	-	-

Table 3. Trip data per location.

24 different people have used the car, half of these people are recurring users, meaning that they used the car more than once. Four users used the cars six or more times, two of these users used the car in Gieten, the other two in Hoogezand and Eelde. This group of recurring users is important for the economic viability of car sharing in the long term. Another thing worth noting is that some users used a car at more than one location. This indicates some people were willing to travel outside of their own village to make use of one of the other shared cars. One person used the car in both Hoogezand and Annen, another in both Hoogezand and Eelde, another in both Hoogezand and Gieten. Two people both used a car in Gieten and Annen and one person used a car in both Gieten and Eelde.

Most trips with the shared cars were made during the weekend, specifically on Saturdays. This finding partially contrasts the findings of the study by Shibayama et al. (2013) who found in their research that most trips are made during weekdays. One of the factors that can influence when cars are used is the purpose of a trip. Shibayama et al. (2013) found that the purposes of trips are equally split between business and leisure purposes. Figure 3, which is based on survey data, gives an overview of the purpose of the trips respondents made.

Figure 3 shows that commuting is the most common purpose next to testing an electric vehicle or testing car sharing which was mentioned four times under the category 'other'. Contrary to the findings of this research, Shibayama et al. (2013) concluded that shared cars were hardly being used for commuting purposes. Additionally, Shibayama et al. (2013) does not discuss testing an electric vehicle/car sharing as a purpose for a trip. Other purposes mentioned under 'other' in figure 3 are to be a caregiver, visiting family, visiting hospital and twice to do groceries. These purposes differ from the expected purpose of use as found by Kamminga et al. (2022c) in the ex-ante research (N=494). Their research found that visiting friends and family and travelling to a hobby were the two most common expected purposes of trips. A potential reason for this difference in purpose between the expected users and actual users might lie in a misjudgement of people on their expected purpose. Another reason could be that people who expected to use the car to visit friends or family or to travel to a hobby never decided to actually use the car, or that the number of people who use the shared car to commute or test electrical driving was larger than they expected themselves.

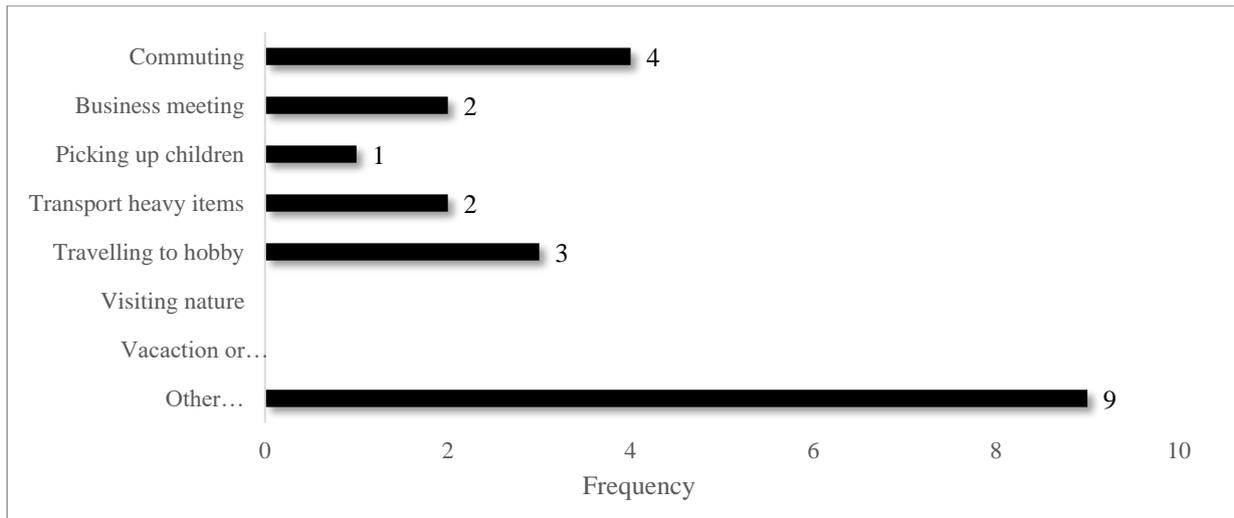


Figure 3. Result of question: What was the purpose of your trip? (N=14).

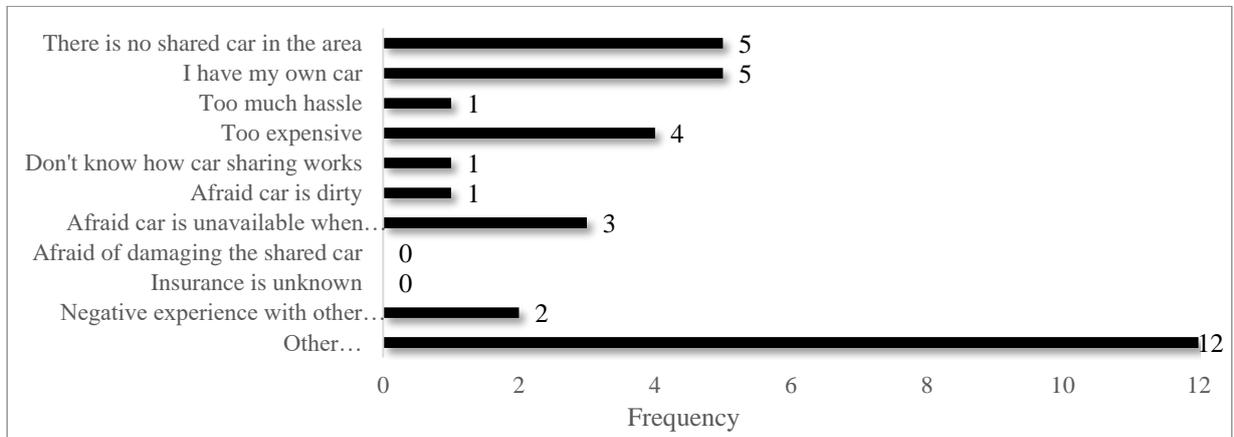


Figure 4. Result of question: You have signed up to use a shared car, why have you not yet used one of the shared cars? (N=20).

Figure 4 shows the result of a question that was only asked to respondents of the questionnaire who had not (yet) used the car. Respondents report a variety of reasons with ‘owning a car myself’ and ‘there is no shared car near me’ being the most common reasons. These two reasons for not using were already found to be two of the most important reasons for not using in the ex-ante research (Kamminga et al., 2022c). Additionally, Münzel et al. (2020) found in their research that there is a positive relationship between proximity to the shared car and usage. Apparently, despite the fact that some of the cars are strategically located in central locations of the villages (some are strategically placed on hubs), several potential users deem these locations to be too far.

The answers in the ‘other’ category can to some extent also be categorised. Four respondents say that they have not yet had time to use the car or had a moment where they needed to use the car. One of these respondents mentions that they previously had two cars but sold one of the cars a while ago. However, usage of the shared car had not yet been needed. Four ‘other’ respondents report on problems with the app, reservation process or availability of the car. Easiness of the app/reservation process and availability of the car were found by Kamminga et al (2022c) to be three of the most influential factors on whether people want to use a shared car or not.

One of these four respondents gave an elaborate response as to why they had not used the shared car: *‘After I did my reservation the car was not there, double reservation?! Besides that, the car is almost always unavailable. Later on I was not able to access the app, and after I made a new application it*

took a month before I got notified that my access was denied. So I will not use it anymore.” Learning is one of the priorities of this pilot. Learning from the user's experiences is part of this process. However, the answer of this respondent clearly displays anger with the organisational structure of the pilot as it took a month to get a reply from the responsible stakeholder. Additionally, the respondent refers to the unavailability of the cars. This unavailability is not the result of innumerable reservations but the result of the removal of the cars during the summer of 2023, however this was never communicated to the (potential) users leaving them in the dark as to why they could not use the cars. Although the pilot was still in its infancy, swift responses to users and open communication are required and possible without much effort, also in this early phase of the pilot. Therefore it has to be concluded that this user became unwilling to use a shared car as result of a lack of communication from the stakeholders to (potential) users.

Three other respondents under the category ‘other’ refer to the location of the car as the obstacle. One respondent lives in Paterswolde, but mentions that the closest to them is located in Eelde. This is too far to walk, luckily there will be a new car in Paterswolde soon, so this problem is tackled. Another of these three respondents specified that they wanted to use a car in Zuidlaren, however, at the time of potential use, this car was not available. Finally, one respondent says the following: *‘For some time the shared cars could not be used. Therefore, I could not use the shared cars when I did not own a private car. Now I have bought my own car, therefore using the shared car is no longer applicable to me.’* This respondent refers to the period during the summer of 2023 in which no cars were available. A recurring user had to buy a private car since the shared cars were not available. Despite the fact that the reasoning to stop the pilot for a while were valid, this response does show that the consequences for the pilot can have a long term impact when recurring users are forced back into a private car.

4.3. Questionnaire results

4.3.1. User characteristics

Unfortunately, there is no demographic data of all the 175 people who signed up to use the shared car, neither is there demographic data specifically on the 24 individuals who have used a shared car of the pilot Hondsrug Noord. Therefore, demographic data of the survey respondents will be analysed (N=32). This survey makes a distinction between users and non-users. The 4 digit postal code of the respondents to the questionnaire can be seen in the appendix. 30 out of 32 responses are shown on the map as the other two respondents' home locations were in other areas of the Netherlands. Almost all of the respondents live in or next to a village in which the shared cars are located meaning that the cars are mainly used by people living nearby.

A series of chi square tests of independence was performed to determine whether there are statistically significant differences in terms of usage for people with different education levels, occupations or gender. A Kruskal Wallis test is performed to test for statistical significance for age. The results of these tests can be found in appendix 7.6 For all of the chi square tests of independence the chi square outcome is smaller than the critical value. The Kruskal Wallis test has a p-value that is higher than 0,05 (0,470>0,005). Therefore, it can be concluded that there is no statistical significance between whether one uses a shared car or not and one's education level, occupation, gender and age.

It is nevertheless relevant to look at the demographic characteristics of the survey respondents as it can give insight into what type of person signed up for the car sharing pilot. Two-thirds of the respondents of the survey are male, see table 4. In the ex-ante research it was also concluded that someone's gender does not influence their expected usage of a shared car (Kamminga et al., 2022c). This research confirms that actual usage is also not significantly influenced by someone's gender. However, this finding is in contrast with earlier studies who found that males are more likely to use a shared car than females (Becker et al., 2017; Shaheen and Martin, 2010).

Age is another relevant factor regarding car sharing usage (Becker et al., 2017; Shaheen and Martin, 2010). Their research found that younger people are more likely to use a shared car. Table 4 shows that most respondents were born between 1960 and 1969 and that relatively few younger people signed up.

A small difference can be found between users and non-users as the average age of users is slightly above 50 years, whereas the average age of non-users is slightly below 50 years. This result is contrary to the findings by Becker et al. (2017) and Shaheen and Martin (2010) who found that car sharing users generally are younger than non-users. However, the Kruskal Wallis test shows that there is no significant relationship between age and usage of shared cars in this research.

Becker et al. (2017) concluded that the likelihood of using a shared car increases with education level. However, Kamminga et al (2022c) found that there is no connection between someone’s level of education and usage of shared cars, this research draws the same conclusion as Kamminga et al. (2022c). In the sample, 75% of respondents can be considered highly educated. This means that people with high levels of education were more likely to sign up for the usage of the shared cars, however, highly educated people did not significantly more often use the shared cars than lower educated people. Nevertheless, it has to be noted that the chi square test of independence was statistically insignificant hence no hard conclusion can be drawn. Finally, table 4 shows that 72% of respondents are working a job. This is no surprise as the largest group of citizens is of working age. The chi square test of independence showed that there was no statistically significant difference between the type of occupation and the usage of the shared cars.

Gender	Percentage	Highest education	Percentage
Male	63%	Primary school	0%
Female	34%	LTS, huishoudschool, VMBO,	3%
Other	3%	HAVO, VWO, HBS, MBO-2, 3 or 4	22%
Year of birth		HBO	41%
1950-1959	13%	University or Postdoctoral	34%
1960-1969	34%	Occupation	
1970-1979	16%	Working	72%
1980-1989	22%	Studying	6%
1990-1999	9%	Retired	9%
2000-2005	6%	Without a job	13%

Table 4. Demographic characteristics of the survey respondents (N=32).

4.3.2. User satisfaction

Figures 5 till 8 show the results of the questions on user satisfaction that were asked to people who have used the shared cars. These questions were asked as pricing, easiness of reservation, accessibility of the car and cleanliness were found to be the most important factors in determining whether people will use the shared cars in the ex-ante research (Kamminga et al., 2022c). Respondents are least satisfied with the pricing. Only 29% of respondents are (very) positive regarding the chosen price setting. The pilot has three types of memberships when it comes to pricing. These are labelled: ‘sometimes’, ‘regularly’ and ‘often’. Specifics can be found in table 5. All of the 175 people who signed up to make use of the cars chose for the ‘sometimes’ subscription type. One recurring user changed his subscription mode to ‘regularly’ after a couple of rides.

In the questionnaire, respondents also got the opportunity to explain any of their desired changes to the pilot. Lower pricing was mentioned by four different users as there needed change that would lead them to make use of the shared cars. One of the explanations for the dissatisfaction with the pricing scheme might lie in the absence of a calculation model with which users can calculate the cost of their ride and compare it with owning a private car or using public transport. Additionally, it is relevant to compare the chosen price setting with the price setting of providers in the urban centres of the pilot region. There are two main providers, Greenwheels and MyWheels. When the subscription mode without fixed monthly costs are compared, price settings are rather similar (MyWheels, 2023 and Greenwheels, 2023). MyWheels does have the benefit that costs per hour are topped off at €40,00 per day, for the pilot this topping off happens after 24 hours. Greenwheels only offers this service when a subscription mode with

fixed monthly costs is chosen. Therefore, it has to be concluded that the price setting is in line with market prices, however, changes regarding the topping off might be needed to entice users who want to use the shared car for more than a couple of hours.

The ex-ante research found pricing to be one of the most important factors for whether people will use the shared car (Kamminga et al., 2022c). 85% Respondents say that it is (highly) important to them that the costs for using a shared car do not exceed the costs of owning a private car, whilst 66% want usage of a shared car to be cheaper than public transport (N=228). It is therefore important that users have a clear idea of how the pricing of car sharing compares to the pricing of owning a private car or using public transport, especially since reducing mobility costs was found to be one of the main motives to use carsharing (Duncan, 2011).

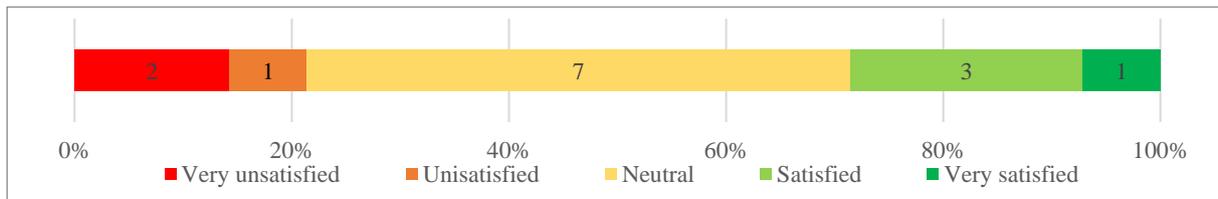


Figure 5. Result of question: How satisfied are you with the pricing? (N=14).

	‘sometimes’	‘regularly’	‘often’
Fixed monthly fee	€0,00,-	€10,00,-	€25,00,-
Price per hour	€6,00,-	€4,00,-	€3,00,-
Price per kilometre	€0,39,-	€0,29,-	€0,22,-

Table 5. Price setting of the pilot Hondsrug Noord per subscription type.

Another important factor according to the ex-ante research is the easiness to reserve (Kamminga et al., 2022c). Most respondents of the questionnaire are positive about the reservation process, see figure 6. In general, no major changes are needed to the reservation process in the app except for one respondent who indicates that it would be helpful if identification via KopieID is possible via the application.

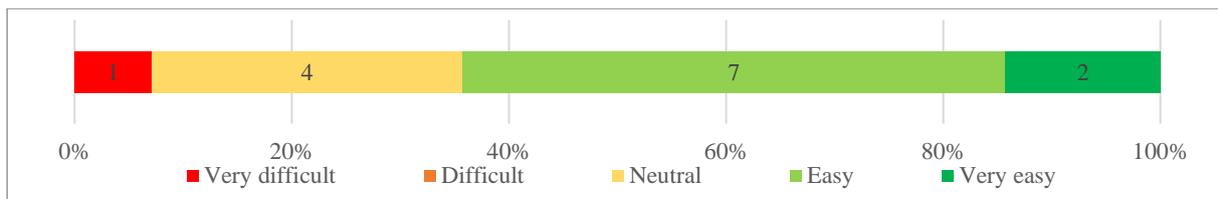


Figure 6. Result of question: How did you experience the reservation process via the application? (N=14).

Accessibility and cleanliness of the car are also rated positively, see figures 7 and 8. Regarding accessibility, several additional comments were made by respondents. Respondents ask for a car on P+R Rolde and in the villages of Grolloo and Paterswolde. A car will be placed in Paterswolde soon, Grolloo will take time as there are problems with charging infrastructure whereas P+R Rolde is unlikely due to infrastructural projects that will take place in the coming year. Another respondent simply answered that they would like to see cars in more different villages. Cleanliness, although important, was not considered a problem for most of the users. The cars are cleaned every month by an external company, or when they are used often, after a certain amount of kilometres. One respondent did however mention as one of their desired changes that more information on this cleaning process is provided to potential users as this is currently not known by users and citizens.

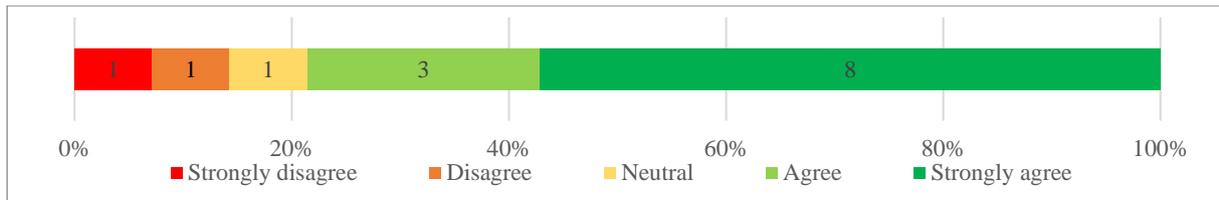


Figure 7. Result of question: Was it easy to access the car? (N=14).

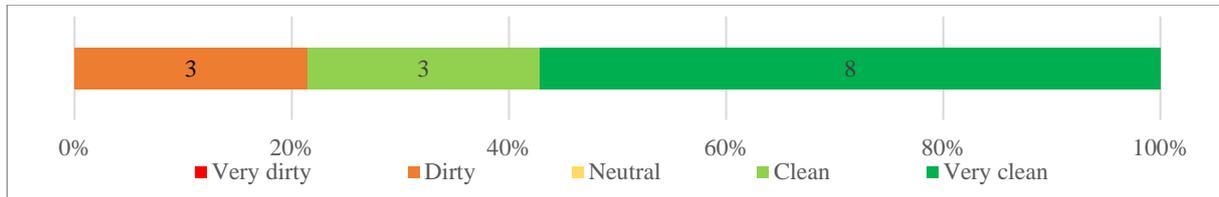


Figure 8. Result of question: How clean was the shared car? (N=14).

4.3.3. Other factors

Variables that are not categorised into one of the three earlier categories will be discussed in this chapter. The findings for the first two variables on familiarity with the cars and preferred location are based on the responses of all people who filled in the questionnaire, regardless of whether they actually used a car (N=32). Therefore, two chi square tests of independence are possible in which it is tested whether there is a difference between users and non-users when it comes to how they became familiar with the pilots' shared cars or where they prefer the shared cars to be located.

Most people became familiar with the shared cars via an advertisement in the newspaper, followed by social media. The chi square test of independence gives an insignificant result, see appendix 7.6 for an overview of the results. This means that no specific way of becoming familiar with the shared cars leads to more usage than the other ways of becoming familiar. It is however important to make as many people familiar with the shared cars as possible. Therefore, one could think that it is most useful to try to reach your audience via newspaper advertisement as this turned out to be the most successful so far.

Regarding parking location results are clear, 75% of the respondents prefer the car to be in their own neighbourhood ('buurt' or 'wijk'). The chi square test of independence shows no significant results meaning that there is no difference in preferred parking location between users and non-users. Similar to this research, the preferred location being the 'buurt' or 'wijk' was also found to be the preferred location by Kamminga et al. (2022c).

In the survey respondents were asked which mode of transport people would have used if they had not used the shared car, in other words for which mode of transport is the shared car a substitution. For instance Shibayama et al. (2013) found that shared cars are used as substitutes of public transport. This is not often the case in the pilot as only two out of 14 respondents indicated that they would have travelled by bus otherwise. No respondent indicated that the shared car was a substitution for a train trip. Most users would have otherwise travelled by private car (36% of respondents), followed by three people who answered under the category 'other' that they would otherwise have had to cancel their appointment.

Sometimes people use other modes of transport besides the shared car to reach their destination, this is called multimodality. The majority of the respondents indicated that they used other modes of transport in the trip that they used the shared car. It is somewhat surprising to see that four people also used their own private car during their trip. Furthermore, a combination of public transport and shared car usage was only done twice. This combination is known as first and last mile connectivity and offers the opportunity for people to reach a public transportation hub (OV-hub) by using the shared car (Shaheen

& Chan, 2016). Although car sharing has this first and last mile potential, users have (hardly) used it for this purpose so far.

Figures 9 till 11 show results on how respondents rate their ride, whether they recommend using the shared cars to others and whether they will use the car again in the future. Especially for figures 10 and 11 results are similar. 79% of respondents would recommend the car to others and indicate that they will (very) likely use the car again in the future. Additionally, figure 9 shows that only 14% of respondents are negative about their ride. Therefore, it can be concluded that the people who have used the cars are generally positive about their experience which shows that the pilot has potential.

It has to be noted that figures 9 till 11 only include people who have used the shared car. Several respondents who did not use the shared car were rather negative about their experience although these specific respondents had the intention of using. One respondent says they encountered a car that was not charged when they wanted to start their ride. This respondent did not get adequate help and had to arrange replacing transport themselves and became unwilling of using the car again in the future. Two other respondents indicated their prolonged issues with getting admitted into the reservation application and explained their ongoing struggles with getting in contact with the responsible person from the shared car provider. The reasons for not using these respondents show that a larger pool of users is within reach. One of the objectives of the pilot should be to have all people willing to use, also actually using a shared car. Issues concerning the reservation process or inadequate communication by the shared car provider are in that case lethal for the usage of potential recurring users.

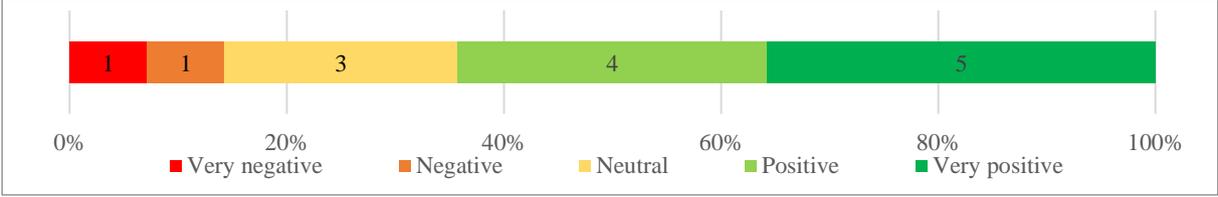


Figure 9. Result of question: How do you rate the overall experience of your ride(s)? (N=14).

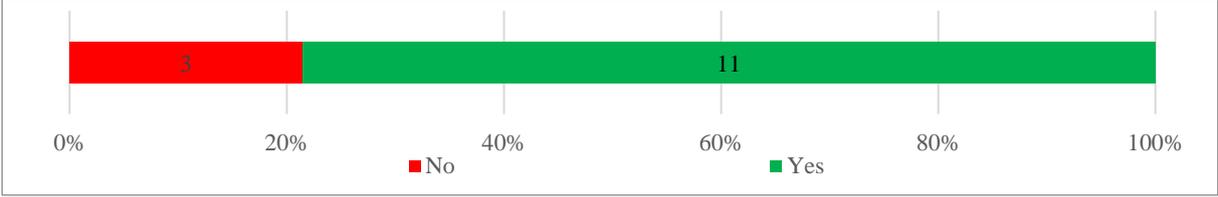


Figure 10. Result of question: Would you recommend the pilot's shared cars to others? (N=14).

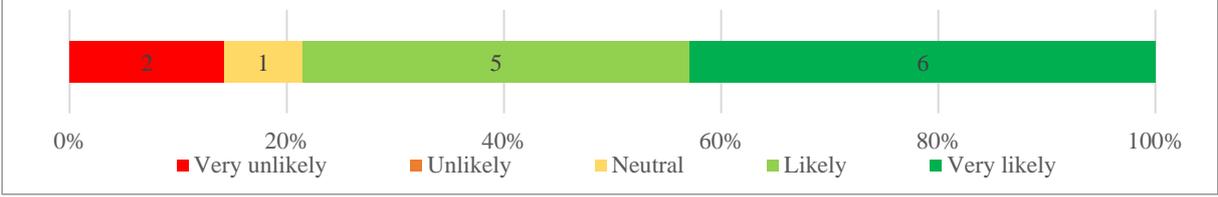


Figure 11. Result of question: Will you use the shared cars of the pilot again in the future? (N=14).

Finally, all respondents were asked to discuss their desired changes or improvements to the pilot. The most common response had to do with the pricing of the cars. Four respondents simply discussed that they find the shared car too expensive, another wanted more clarity about the pricing, whereas another respondent likes to see cheaper pricing for longer trips specifically. Three respondents discussed the need for more advertising as according to them very few people currently know about the existence of the shared cars. Earlier research into rural car sharing also concluded that a lack of awareness by citizens is a problem for car sharing, therefore generating awareness is one of the most important priorities

(Schaefer et al., 2022 and Rotaris & Danielis, 2018). Furthermore, two other respondents mentioned the poor visibility of the car at the locations, they see room for improvement by usage of bigger signage. Other things that were mentioned regarding location of the cars are more villages with a car, more cars per village or specifically a car in Rolde, Grolloo or Paterswolde. Finally, respondents mentioned that they would like the shared car provider to get in contact with them as currently the shared car provider remained radio silent despite several tries by the respondent. Another respondent requests shared bikes at the location of the shared cars, more information regarding usage of an electric vehicle or information on how to disconnect an electric car from the charging dock.

4.4 Reflective learning in a car sharing pilot

4.4.1. Introduction

The theory behind reflective learning was specifically discussed in chapter 2.5 and visualised in figure 2. The model of reflective learning by Kolb (1984) was determined to be the most suitable strategy to implement reflective learning in the pilot Hondsrug-Noord as Kolb's model is suitable for multi-actor complex policy situations. The model consists of four iterative stages: concrete experience, reflective observation, abstract conceptualism and active experimentation (Kolb, 1984). These steps are translated into the action, observation, reflection and revise step in this research. During the first year of the pilot Hondsrug-Noord a structure was kept during and in between the meetings. In chapter 4.4.2 the roles of the actors and their corresponding responsibilities are discussed after which chapter 4.3.3. analyses how each actor dealt with the hurdles that occurred during the first year of the pilot. Chapters 4.4.4 till 4.4.6 analyse the proposed and actual alterations to the setup of the pilot that were discussed during the formal meetings. Kamminga (2022a,b) identified four main alterable factors that stakeholders could tweak to influence usage and user satisfaction. These factors are the price setting, public awareness strategy, return option and location/number of cars. Three of these alterable factors were topics of discussion during multiple meetings, therefore these factors get specific attention as the deliberations on these topics show how the process of reflective learning was implemented in practice. Finally, chapter 4.4.7. reflects on the implementation of reflective learning and whether this was an active and/or passive process.

4.4.2. Relationship province of Drenthe, Regio Groningen-Assen, shared car provider and evaluator

Since the researcher became involved with the car sharing pilot Hondsrug-Noord in early 2023 four formal meetings were hosted. These meetings took place on the 13th of March 2023, the 26th of May 2023, the 31st of October 2023 and the 28th of November 2023. During the meetings representatives of all the stakeholders were present. The stakeholders are the province of Drenthe, Regio-Groningen Assen, a car company and an independent researcher. The province of Drenthe and Regio-Groningen Assen are part of the pilot as they both share the ambition of increasing shared car usage. The car company won a tender that was issued by the province of Drenthe and Regio Groningen Assen. They have an incentive of making the pilot a success as financial profit made with the shared cars flows towards the car company. The final stakeholder, the evaluator, is the writer of this thesis and therefore responsible for the ex-durante research of the pilot.

4.4.3. Hurdles during the pilot

On paper the pilot has a clear division of roles, responsibilities and duties during and in between the meetings. However, as can be expected during a pilot, unforeseen circumstances can occur. Although the meetings are meant to reflect on the usage of the cars and discuss the revision to the setup, most of the time during the meetings had to be set aside to discuss issues surrounding the placement of cars, charging stations, unpaid bills by users and other unforeseen circumstances. As these preconditions for a successful pilot like the cars being at their proposed locations or having someone assigned to the client contact were not arranged properly before the start of the pilot, things still had to be arranged after the pilot had started.

A pilot offers the opportunity to learn and see whether an idea actually stands a chance in the real world. For this research this means that the pilot started to test whether car sharing has potential in the rural area of the Hondrug Noord. Therefore, the learning capacity of the pilot was hindered to some degree by the absence of shared cars at the destined location in due time. On the other hand, one can argue that the pilot has learned the different stakeholders that setting up a car sharing project/pilot is not a straightforward linear process. This became even more apparent in April 2023 when the car pilot was stopped for an indefinite duration as cars were used for wrong purposes and a very substantial part of the bills were not being paid. The stakeholders eventually held a meeting on the 26th of May in which the car provider elucidated the other stakeholders on this decision.

It was concluded by the stakeholders that changes had to be made to the entry barrier of the shared cars. In the first few months of the pilot, potential users could download the car sharing app, scan their driver's licence and use the car. After this meeting it was decided that potential users have to scan their driver's licence and identification and link their bank account. Additionally, users have to do an intake with the car provider, either online or in one of their showrooms. This prevents people with wrong intentions from using the shared cars, and makes it possible for the car company to retrace people who do not pay their bills. So unfortunately entry barriers had to be raised significantly, which is something that you want to prevent as much as possible with car sharing, but due to the circumstances it was deemed unpreventable.

As discussed earlier, the other meetings of the 13th of March, the 31st of October and the 28 of November also had a different character than originally intended. The last two meetings took place within a month of each other as the stakeholders agreed amongst each other that more effort was needed during the 31st of October. Therefore, the stakeholders agreed that meetings would become monthly instead of the intended half yearly. However, during all of these three meetings discussion points were mainly on how to prevent wrongdoing and how to get more cars on the intended location, and not about the original idea of the meetings: discussing how to increase the usage of the shared cars by making changes to the set up. Nevertheless, five cars were available for public use between the first (13th of March 2023) and last meeting (28th of November 2023). Therefore, stakeholders still reflected on the usage of these cars and analysed whether this usage could be increased by making alterations to the pilot setup. This was done by discussing possible changes to the imperative conditions for rural car sharing, see figure 2. The next three paragraphs describe the conclusions and follow ups in more detail.

4.4.4. Locations and number of cars

The original idea of the pilot was to place 13 cars at 13 different locations at the start of the pilot in September 2022, see figure 1. However, in September 2022 only one car was placed in Gieten, the others 12 locations were destined to be placed in a short time. In the following months four other cars were placed, see table 3. The placement of the cars was a point of discussion during the meetings. The cars were not placed because permits for parking spots for the shared car were not given by municipalities, because (permits for) charging stations were not available at the parking spots or because signage for the shared cars was yet to be placed at new locations before a car could be placed. During the meeting of the 13th of March 2023, all five cars that are included in the analysis were at its place. Although stakeholders urged the province of Drenthe (responsible for permitting and charging stations) to allow more cars to be placed, confidence in expansion of the number of cars in a short time was positive as in the months before four cars were placed.

During the meeting of May 26th 2023 it became apparent that no cars were available for the public. During this meeting the addition of new cars was not discussed as there were urgent problems that needed discussion, see chapter 4.4.3. During the meeting of October 31st 2023, which was held after the cars were available for public use again, the shared car provider urged the province of Drenthe to speed up the process in order to make more locations ready for the placement of cars as the car provider has car ready to be placed, however the province of Drenthe had not yet succeeded in the installation of charging infrastructure of signage on the intended locations. In that regard the meeting of November 28th

2023 brought positive news as since the previous meeting a car was placed on the P+R hub of Haren. Additionally, the province of Drenthe had more positive news on the locations. Signage for the cars in Tynaarlo, Paterswolde and Gasselte were ordered and it is a matter of time before the cars are available on these locations. It became apparent that it is unlikely that the cars in Grolloo, Borger and Westlaren could be placed anytime soon due to issues with charging station permits. Therefore, some modifications to the locations were agreed upon. The stakeholder of the province of Drenthe will research the viability of these changes. The proposed changes are moving the shared car from P+R Borger to the village centre of Borger where charging stations are currently present. Moving the shared car for P+R Westlaren to the village centre of Gieten, as Gieten is the village where usage was the highest in the earliest months of the pilot. The last change concerns the car in Vries, which potentially could be moved to the municipal hall in the Vries where existing charging stations are present.

4.4.5. Price setting

The chosen price setting, see chapter 4.3.2., was not challenged during the meeting of March 13th 2023 as the data that the car provider shared with the other stakeholders during the meeting showed a gradual rise in usage. This gave all stakeholders the feeling that the pilot was on the right track, hence changes to the price setting were not discussed. During the meeting of the 31st of October it became apparent that the cars were hardly being used since the summer of 2023. Therefore the chosen price setting was discussed as lowering the price setting could be an incentive for people to start using the car again. However, the car provider made clear that no alterations to the pricing were possible as the costs had been high due to the unpayment of the majority of the bills in the starting months of the pilot, see chapter 4.4.3. The discussion on pricing had a different character during the meeting of November 28. The researcher discussed the first insights from the survey in which it became apparent that several respondents are not aware of the market conformity of the price setting, see chapter 4.3.2. The stakeholders agreed that (potential) users had to become better aware of the pricing, also in relation to for instance private car ownership. Therefore, before the next meeting the car provider would investigate whether it is feasible to implement a calculation tool into the reservation app that can give users an indication of the price of their trip before they make the trip.

4.4.6. Awareness strategy

The awareness strategy was not challenged during the meeting of March 13th 2023 as the data that the car provider shared with the other stakeholders during the meeting showed a gradual rise in usage. This gave all stakeholders the feeling that the pilot was on the right track, hence changes to the awareness strategy were not discussed. During the meeting of the 31st of October it became apparent that the cars were hardly being used since the summer of 2023. The removal of the cars, which was done for valid reasons (abuse, high percentage of unpaid bills), was not communicated to users or via media channels. The reasoning for this was that this type of publicity has a negative nature, however, as was seen in chapter 4.2., the effect of this absence of communication was that some actual users became frustrated with the pilot and became reluctant to use the shared cars again. Therefore, the stakeholders agreed that the representative of Regio Groningen-Assen would reach out to several regional papers to increase publicity in the papers. Additionally, all stakeholders would make use of the (social) media channels of their own organisation.

No concrete results in terms of an increase in advertising were made before the last meeting on the 28th of November. However, during this meeting the awareness strategy was again a major topic of discussion. The researcher gave insights on how users became familiar with the pilot during. The survey indicated that several respondents complained about the lack of visibility of the car both at the location and in the news/social media. Therefore, several concrete solutions were agreed upon that were researched on their viability in the month of December. One of the proposed solutions is having a banner near the car in Gieten which improves visibility from far. Additionally, more advertising in newspapers and on social media. Newspapers were included as most respondents in the survey indicated that they became aware of the shared car via a newspaper advertisement. The stakeholder of the Regio Groningen-

Assen would also research the possibility of including the pilot Hondsrug Noord in the national campaign on car sharing. Results of these measures are not included in this thesis due to the end date of this research.

4.4.7. Implementation of reflective learning

Finally it is relevant to discuss whether the application of reflective learning happened as a conscious choice by the stakeholders or as an organic process in the pilot situation. As discussed earlier, the pilot has seen up's (first car available, steady increase in usage in first few months) and downs (unpaid bills, wrongdoing with the cars, increase in available cars was lagging). The strategy of reflective learning gave the stakeholders a framework to structure meetings and the intermediate moments (action-observation-reflection and revise plan). However, the strategy of reflective learning was not implemented actively by the stakeholders during the first three meetings. Although four steps (action, observation, reflection and revise plan) were to some extent implemented organically, no conscious deliberations on the active implementation were made by the stakeholders. The main reason for this lies in the changing nature of the meetings. Initially the meetings were meant to reflect on the observations regarding usage and user satisfaction after which the stakeholders could make the needed adjustments to the setup of the pilot. However, as the pilot was only operational to a small extent, the meetings mainly focussed on getting the pilot up and running. This severely hindered the learning potential of the pilot, both in terms of finding out how to increase usage, but also on how to give shape to a pilot process.

Stakeholders could have improved the learning potential of the pilot in two ways. Firstly, by creating a fully operational setup of the pilot before it started in September 2022. Secondly, the strategy of reflective learning could have helped stakeholders to also reflect on their own contributions to the pilot. This self-reflection happened collectively during the meeting of the 31st of October. During this meeting stakeholders realised that a change in their attitude is needed to make the pilot a success. In the following month, a conscious application of the reflective learning became apparent as stakeholders took action, which was reflected during the meeting of the 26th of November. Based on this reflection, revisions were made to the plan, for instance by creating an active strategy to create more public awareness. Although the reflective cycle was originally meant to reflect on the usage of the shared cars, it was now used to reflect upon the setup of the pilot and the stakeholders roles within the pilot.

Nevertheless, this application of the strategy of reflective learning primarily was an organic process that was not done by actively applying the theory of reflective learning. However, the application of reflective learning, conscious of or not, helped the pilot to progress from a rudderless situation to a situation in which progress is made during the month of November 2023. In that regard it can be concluded that the strategy of reflective learning has proven its usefulness. Consequently, the progress of the pilot would have been more positive if the stakeholders had applied the process, preferably in a conscious manner, from the start.

5. Conclusion

In this chapter answers to the research questions of this study are formulated based on the findings. This is done by first answering all four sub-questions separately, after which the main research question is answered. Thereafter, the generalisability of findings is discussed and recommendations to the planning practice and future research are made. The research ends with a reflection of the researcher on his own role in the pilot and research process.

5.1. Sub questions

1. Which factors influence the success of existing shared car services in rural areas?

In the theoretical framework several factors were distinguished that influence the success of a rural car sharing scheme. Silberer et al. (2022) determined performance expectancy, hedonic motivation and facilitating conditions to be important conditions. Additionally, car sharing is more common in areas with low car ownership and where dependence on daily usage of a car is low. This is an unfavourable condition for rural areas where car ownership and dependence is relatively high (Prieto et al., 2017; Wappelhorst et al., 2014). The demographic composition of a population also influences rural car sharing. Becker et al. (2017) found that a young middle-class male who is highly educated and from a household of below average size is the most common user of a shared car. Rotaris and Danielis (2018) classify a young environmentally person to be the most common user. This type of person is, generally, less likely to live in a rural area than an urban area. Five factors were deemed to be imperative conditions for successful rural car sharing. These factors are the chosen business model, price setting, public awareness strategy, return option and good public transport. The chosen business model offers two options: B2C and P2P. B2C schemes have the advantage that they do not rely on the willingness of citizens to share their car, P2P services have the benefit that they are not affected by population density (Meelen et al., 2019; Münzel et al., 2020). The majority of people want the price per kilometre of a shared car usage to be lower than the price per kilometre of their private car or public transport (Kamminga et al., 2022c). Organisers have to consider their strategy for creating awareness for their shared cars. This can be done in an active way via (social)media channels, papers or by offering free trials, or in a passive way by hoping that worth-of-mouth advertising is sufficient. The one-way-station based is the most popular return option for rural car sharing users (Kamminga et al., 2022c). Finally, good public transportation in rural areas is of importance for users to be able to reach the shared cars, this is referred to as first and last mile connectivity and in doing so allows more people to reach and use shared cars which are for instance located at hubs (Shaheen & Chan, 2016).

2. How can the practice of reflective learning be used to increase the effectiveness of pilots?

Reflective learning is an evaluation strategy that is used by policy makers to assess whether policy measures are effective and suitable. Evaluation of policy can be done after a project or pilot is finished, but it can also be done whilst a project/pilot is running. Reflective learning is an example of an evaluation strategy that is done whilst a project/pilot is running. Reflective learning means that stakeholders jointly learn from experiences in the project and use these experiences to improve a project whilst it is operational. This is done via meetings in which all stakeholders participate. During these meetings stakeholders collectively reflect and interpret the output of the pilot. When the stakeholders deem change to be necessary, changes to the setup of a pilot are made. In order for the process to be effective, stakeholders should adhere to several principles. These principles include that stakeholders give meaning to what they observe in a pilot together, have an open attitude, are willing to learn and systematically apply the process during every meeting. Therefore, when the principles and iterative steps of reflective learning (action, observation, reflection, revise plan) are correctly applied, the effectiveness of a pilot increases as the learning capacity of a pilot improves which results in alterations to the pilot that better suit the specific reality in which a pilot takes place.

3. How does the carsharing pilot Hondsrug Noord perform in terms of usage and user satisfaction, and does this differ from the ex-ante expectations?

In the first year of the pilot, usage of the shared cars in the pilot Hondsrug Noord is less than expected and hoped for. In the first months (end of 2022), usage numbers were reaching the financial break-even point. However, it turned out most bills were not being paid and several users abused the cars by for instance abandoning it in Flevoland. Therefore the pilot was paused during the spring/summer of 2023 and entry barriers were increased. After this break cars became available again for public use but were rarely used anymore. Usage of the cars was considerably lower than the ex-ante research expected (Kamminga, 2022c). This research concluded that 70 people expected to use the shared cars multiple times a month and 28 people expected to use the car once a month (N=228). In reality, a total of 58 trips were made by 24 total users over a period of several months. It has to be noted that the respondents in the survey by Kamminga et al. (2022c) may live in villages that were expected to get a shared car but so far have not yet done so, which is why these people did not end up using the car.

In general, satisfaction of users is positive. Cleanliness, accessibility of the cars and the reservation process are all rated positively by the majority of the users. Users were more critical about the pricing. Although the pricing is in line with competitors in urban areas, some of the users still were critical. A possible solution for the discontent of these users could be to offer a price indication in the reservation app of the expected trip and a comparison of the price with that of other car sharing providers. Additionally, several users were negative about the visibility of the cars, both at its parking location and in the media. Therefore, more emphasis needs to be put on making people aware of the existence of the pilots' shared cars. Overall, it can be concluded that the lack of usage is at least partly explained by the break in the summer, however after this break a lack of active campaigning has meant that users have not found their way to the shared cars. As users are generally satisfied with their rides, campaigning on the existence of the cars, the pricing and other benefits of car sharing needs to first have priority.

4. To what extent was the practice of reflective learning used in the pilot Hondsrug Noord?

The process of reflective learning and its accompanying cycle were to some extent used in the car sharing pilot Hondsrug Noord although in a different manner than originally intended. The reflective cycle with its four stages (action, observation, reflection, revise plan) was meant to help stakeholders reflect on the usage of the shared car and determine which alterations were needed to the setup of the pilot in order to increase the usage and/or user satisfaction. However, as the amount of available cars was lacking and wrongdoings with the cars was common, the reflective cycle was instead used during the meetings to make stakeholders reflect on how to increase the number of cars and reduce wrongdoings.

Additionally, the process of reflective learning was not actively applied by stakeholders but organically. During the first meetings reflection barely took place as stakeholders were primarily focussing on solving practical issues. Therefore, no room was created for reflection on the pilot. During the meeting of the 31st of October the strategy of reflective learning was used for its intended purpose, reflecting on usage of the cars and deliberating on which alternations are needed to the pilots setup as well as to the input of the stakeholders. This has helped the pilot process, therefore proving the value of reflective learning to this pilot. During the remainder of the pilot, stakeholders should keep using the strategy, even if it is unconscious as applying the process leads to more conscious decision making and active reflection which will lead to better responses to future problems that occur in the pilot.

5.2. Main research question

This research set out to answer the following research question: *What conditions influence the success of shared car services in rural areas like North-East Drenthe?* The theoretical framework and results chapter have identified several factors that influence the success of car sharing in rural areas. The demographic composition of rural areas is, in general, less favourable to car sharing than the demographic composition of urban areas. The most common user type is a young middle-class male who is highly educated. Additionally, low levels of car ownership increase usage of shared cars.

Relatively few young people live in the researched area and car ownership is high. Therefore, it was concluded that the demographic build-up of the population of the research area does not fit the most common user type.

Furthermore it was concluded that five factors are crucial for a successful rural car sharing. These factors are having the correct business model, price setting, return option(s), awareness strategy and public transportation connections. For all these factors, car providers should find the right balance between what is feasible and what users prefer. In the pilot Hondsrug Noord the chosen business model is the B2C model as this is the only option in which a car company provides cars. Price setting should be as low as possible, but still cover costs. Several return options are possible with the one-way-station based being the most popular in rural areas. The stakeholders opted for the round-trip option as this the easiest option to implement which makes setting up a pilot more feasible. The awareness strategy should focus on a variety of different channels ranging from newspaper to online and social media. Good public transportation is needed as this allows for multimodal trips, however this research concluded that few users used both public transportation and the shared car in the same trip.

This research has taught the stakeholders that awareness is vital for having a successful rural car sharing project. Awareness refers in the first place to creating publicity for the shared cars through media channels. Additionally, cars should be more visible on the location where they are placed. Awareness regarding price was also found to be highly important. The most common feedback of (potential) users concerned complaints about the level of pricing, however another common complaint concerned the lack of information about the pricing. The final condition influencing rural shared car usage is the entry barrier of the car. The pilot Hondsrug Noord has faced major struggles because people with wrong intentions used the shared cars. Therefore, entry barriers were raised which also resulted in a decline of usage by people with the right intentions. Therefore, car sharing pilots should closely monitor what changes in entry barriers mean for the usage of the shared cars.

5.3. Generalisability of findings

The generalisability of the findings of this research should be approached with great care. The statistical tests were not significant, meaning that this research cannot conclude that age, gender, occupation, education level, way of becoming familiar with the pilots' shared cars or preferred parking location of a user directly influences the usage of the shared cars. This non statistically significant finding can at least partly be explained by the limited size of the dataset (N=32). Additionally, some of the questions contained a relatively high number of answer categories which makes obtaining a statistically significant result more difficult. One could argue that no statistical testing should be done as finding significant results is very unlikely with such a low number of respondents. Nevertheless, this research does include these statistical tests as leaving them out might leave readers wondering about the significance and generalisability of some of the findings.

It is difficult to determine the effect of (the limited) changes to the pilots setup on the usage of the shared cars due to the break in the pilot. Two conclusions were drawn which are that the increase of entry barriers had a negative impact and that usage will be scarce when there is no active campaigning. However, the break impacts the generalisability of the findings as such a break is not planned and uncommon in other rural car sharing projects. Additionally, no major changes to the setup were made as the pilot was not in full operation. Therefore, one has to be cautious about the generalisation of the findings for rural car sharing in general as the circumstances of this pilot are highly specific.

Lastly, one has to be cautious about the extent to which the research area can be considered rural. Although the research area is rural considering Dutch standards (CBS, 2021d), the area might not be considered rural in other countries as population density is still relatively high compared to other rural areas in other countries. Additionally, some difference in rurality might be present between the villages in the pilot as for instance the car in Eelde as is for instance closer related to Groningen and Assen than Gieten, Annen, Zuidlaren and Hoogezand. This might also be the explanation as to why the majority of

trips from Eelde were made to urban cores, whereas for the other villages trips were made to both urban cores and rural destinations.

5.4. Recommendations to the planning practice and future research

This research contributes to the body of literature on rural car sharing. By doing so, the research gap on rural car sharing decreases and comprehension of rural car sharing increases. Additionally, this research is relevant for society as a whole as it helps improve a rural car sharing pilot. Based on the findings, recommendations for future research can be made.

Future research should research a pilot that is operational for a longer period of time which allows for experimentation with different pricing structures, awareness campaigns and return options. Secondly, research should incorporate a survey into the reservation app which allows direct feedback of users on after ride instead of a survey months after their ride which focuses on their opinion on the pilot as a whole. Furthermore, car sharing in other rural areas should be researched as this will lead to a more comprehensive understanding of rural car sharing. This research does not have to be restricted to other car sharing pilots but can also focus on fully operational rural car sharing projects like Deelslee in the province of Groningen.

Planning practice should focus on continuation of the car sharing pilot Hondsrug Noord for at least the remainder of the pilot. However, continuation after this date is advised as during the first year the pilot was only operational for a limited time with a limited amount of cars. Therefore, planning practitioners have not yet had the chance to learn from the pilot, or make changes to the setup of the pilot and see what these changes mean for usage and user satisfaction. Additionally, the application of the strategy of reflective learning is advised for planning practitioners who are part of a pilot. Reflective learning forces stakeholders to reflect on the progress of the pilot, their own role in the pilot and propose changes to the pilot and their own contribution. Therefore, after a difficult first year, stakeholders embraced the pilot again during the end of 2023, which hopefully leads to a successful car sharing pilot Hondsrug Noord in 2024.

5.5. Reflection

Like every other research, this thesis has its strengths and weaknesses. A strength is that this thesis gives advice to a real life car sharing pilot and therefore has a real impact. A weakness is that the survey only had a limited number of respondents which limits the generalisability of the findings.

I found writing the theoretical framework of my thesis very interesting as it gave me a very thorough understanding of all the many dynamic factors that influence car sharing and liveability of rural areas. Combining all these interlinking factors into one comprehensive conceptual model turned out to be challenging as it took several attempts and meetings to make it an all-encompassing model which satisfied me.

Looking back on the process, this thesis has taken longer than expected. The research looked into a real life car sharing pilot, which made it very interesting to do as I know that the results of this research will have an impact in the world out there. However, as this research was dependent on the pilot for data collection, the research completion was delayed. The break of the pilot also influenced my motivation as many things became unclear regarding the continuation of the pilot. However, in the last few months I have seen that the stakeholders have found renewed energy to make the pilot a success story. This had a contagious effect on me. To conclude, I hope that this thesis is not only appreciated by my supervisors but also by the stakeholders of the pilot Hondsrug Noord and that the findings have a positive effect on the pilot Hondsrug Noord.

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7. Appendix

Appendix 7.1. Questionnaire on user satisfaction

[Openingspagina]

Beste deelauto gebruiker,

In het afgelopen jaar heeft Century in Gieten, Annen, Zuidlaren, Eelde en Hoogezand deelauto's geplaatst. Wij zijn erg benieuwd wat u van onze deelauto's vindt, op welke manier u de deelauto's gebruikt en welke dingen u graag veranderd zou zien. Daarom hebben wij in samenwerking met de Rijksuniversiteit Groningen een korte vragenlijst opgesteld waarin u ons kunt laten weten wat u vindt! Het invullen duurt **minder dan 5 minuten** en de antwoorden zijn **niet naar u persoonlijk te herleiden**.

Als dank voor het invullen van de vragenlijst willen wij u **één uur gratis deelautogebruik** aanbieden in een van onze deelauto's. Als u hiervan gebruik wilt maken kunt u aan het einde van de vragenlijst uw e-mailadres achterlaten waarna Century dit gratis uur automatisch aan uw account toevoegt!

Hartelijk dank voor uw medewerking,
Century Autogroep

[Heeft u een deelauto gebruikt?]

Vraag 1: Heeft u in het afgelopen jaar gebruik gemaakt van één van onze deelauto's in Gieten, Annen, Zuidlaren, Eelde en/of Hoogezand?

- Ja (Ja, vragenlijst gaat verder bij vraag 2 t/m vraag 14 & vraag 18 t/m vraag 24).
- Nee (Nee, vragenlijst gaat verder bij vraag 15 t/m vraag 24).

Indien antwoord op vraag 1 is: Ja, vragenlijst gaat verder bij vraag 2 t/m vraag 14 & vraag 18 t/m vraag 24.

Indien antwoord op vraag 1 is: Nee, vragenlijst gaat verder bij vraag 15 t/m vraag 24.

[Antwoord Ja op vraag 1]

Vraag 2: Welke deelauto(s) heeft u gebruikt? Meerdere antwoorden mogelijk...

- Gieten
- Annen
- Zuidlaren
- Eelde
- Hoogezand

Vraag 3: Hoe vaak heeft u een van onze deelauto's gebruikt?

- Eén keer
- Twee keer
- Drie of vier keer
- Vijf keer of vaker

Vraag 4: Voor welke activiteit heeft u de deelauto gebruikt? Meerdere antwoorden mogelijk...

- Woon-werkverkeer
- Zakelijke afspraak
- Ophalen/wegbrengen kinderen
- Vervoer van zware spullen
- Van en naar hobby
- Om een natuurgebied te bezoeken
- Vakantie of een weekend weg
- Anders, namelijk...

Vraag 5: Stel u had de deelauto niet gebruikt. Welk vervoermiddel had u anders gebruikt om op uw bestemming te komen?

- Eigen auto
- Bus
- Fiets
- Elektrische fiets/speed pedelec
- Taxi
- Brommer, scooter, snorfiets
- Trein
- Anders, namelijk...

Vraag 6: U heeft voor (een deel) van uw reis/reizen gebruik gemaakt van de deelauto, hebt u tijdens deze reis/reizen ook gebruik gemaakt van andere vervoermiddelen om op uw bestemming te komen? Meerdere antwoorden mogelijk...

- Nee, alleen de deelauto
- Ja, ook lopend
- Ja, ook met de (elektrische) fiets
- Ja, ook met de bus
- Ja, ook met de trein
- Ja, ook met de eigen auto
- Ja, ook met een ander vervoersmiddel, namelijk...

[U krijgt nu zes stellingen waarbij u uw mening kunt geven. Daarnaast zijn wij erg benieuwd naar waarom u dit vindt. U kunt uw mening daarom toelichten.]

Vraag 7: Hoe beoordeelt u de rit(ten) die u heeft gemaakt met onze deelauto's?

- Hele slechte ervaring
- Slechte ervaring
- Neutraal
- Goede ervaring
- Hele goede ervaring

Vraag 8: Licht uw keuze toe.

---Tekstvak---

Vraag 9: Wat vindt u van de prijs die u voor de rit(ten) heeft betaald?

- Zeer ontevreden
- Ontevreden
- Neutraal
- Tevreden

- Zeer tevreden

Vraag 10: Licht uw keuze toe.

---Tekstvak---

Vraag 11: Wat vond u van het reserveren van de deelauto via de applicatie?

- Zeer lastig
- Lastig
- Neutraal
- Makkelijk
- Zeer makkelijk

Vraag 12: Licht uw keuze toe.

---Tekstvak---

Vraag 13: Was het makkelijk om de deelauto te bereiken?

- Zeer oneens
- Oneens
- Neutraal
- Eens
- Zeer eens

Vraag 14: Licht uw keuze toe.

---Tekstvak---

Vraag 15: Hoe schoon was de deelauto?

- Helemaal niet schoon
- Niet schoon
- Neutraal
- Schoon
- Zeer schoon

Vraag 16: Licht uw keuze toe.

---Tekstvak---

Vraag 17: Hoe waarschijnlijk is het dat u in de toekomst onze deelauto's nogmaals gaat gebruiken?

- Zeer onwaarschijnlijk
- Onwaarschijnlijk
- Neutraal
- Waarschijnlijk
- Zeer waarschijnlijk

Vraag 18: Licht uw keuze toe.

---Tekstvak---

Vraag 19: Zou u onze deelauto's aan anderen aanbevelen?

- Ja -tekstvak-
- Nee -tekstvak-

[Antwoord Nee op vraag 1]

Vraag 20: U hebt zich ingeschreven om een van onze deelauto's te gebruiken, wat is de reden dat u (tot op heden) nog geen auto hebt gebruikt? Meerdere antwoorden mogelijk...

- Er staat geen deelauto in de buurt
- Ik heb een eigen auto
- Het lijkt mij gedoe
- Ik vind het te duur
- Ik weet niet hoe het werkt
- Ik ben bang dat de auto smerig is
- Ik ben bang dat de auto er niet staat wanneer ik hem nodig heb
- Ik ben bang om schade te rijden
- Ik weet niet hoe ik verzekerd ben
- Ik heb een negatieve ervaring met een andere deelauto
- Anders, namelijk...

Vraag 21: Wat zou u graag verandert zien waardoor u wel een van onze deelauto's wilt gebruiken?

---tekstvak---

[Antwoord zowel Ja of Nee op vraag 1]

Vraag 22: Hoe bent u over onze deelauto's te weten gekomen?

- Via familie/vrienden/kennissen
- Via een online advertentie
- Via een advertentie in de krant
- Via social media
- Door eerdere ervaring(en) met deelauto's

Vraag 23: Waar moet een deelauto volgens u geparkeerd staan?

- Bij mij in de straat
- Bij mijn in de buurt
- Bij mij in de wijk
- Bij een station
- Bij een bushalte
- Bij een ov hub buiten het dorp

Vraag 24: Heeft u nog verdere opmerkingen die u wilt delen met betrekking tot uw deelautorit? Dit kunnen bijvoorbeeld ervaringen of verbeterpunten zijn.

---tekstvak---

[Demografische kenmerken]

Vraag 25: Wat is uw geslacht?

- Man

- Vrouw
- Anders/Zeg ik liever niet

Vraag 26: Wat is uw geboortejaar?

---tekstvak---

Vraag 27: Wat zijn de eerste vier cijfers van uw postcode?

---tekstvak---

Vraag 28: Wat geldt voor u?

- Werkzaam (loondienst, ZZP'er, ondernemer)
- Schoolgaand
- Gepensioneerd
- Zonder werk op dit moment
- Anders, vul in...

Vraag 29: Wat is uw hoogst afgeronde opleiding?

- Lagere school of basisschool
- LTS, huishoudschool, VMBO, MAVO, MULO, MBO-1
- HAVO, VWO, HBS, MBO-2, 3 of 4
- HBO
- WO, postdoctoraal

[Emailadres gratis reistijd]

Vraag 30: U kunt als u wilt hier uw emailadres achterlaten waarmee u bij onze deelauto service staat ingeschreven. Century zal als dank voor het invullen van de vragenlijst één uur gratis deelautogebruik aan uw account toevoegen.

---tekstvak---

[Einde van de vragenlijst]

U hebt het einde van de vragenlijst gebruikt.

Uw antwoorden worden volledig anoniem verwerkt om onze deelauto service verder te verbeteren.

Hartelijk dank voor het invullen,
Century Autogroep

Email die geadresseerden krijgen in hun mailbox:

Beste deelauto gebruiker,

In het afgelopen jaar heeft Century in Gieten, Annen, Zuidlaren, Eelde en Hoogezand deelauto's geplaatst. U ontvangt deze e-mail omdat u zich heeft ingeschreven om gebruik te maken van onze deelauto's. Wij zijn erg benieuwd wat u van onze deelauto's vindt, op welke manier u de deelauto's gebruikt en welke dingen u graag veranderd zou zien. Daarom hebben wij in samenwerking met de Rijksuniversiteit Groningen een korte vragenlijst opgesteld waarin u ons kunt laten weten wat u vindt! Het invullen duurt **minder dan 5 minuten** en de antwoorden zijn **niet naar u persoonlijk te herleiden**.

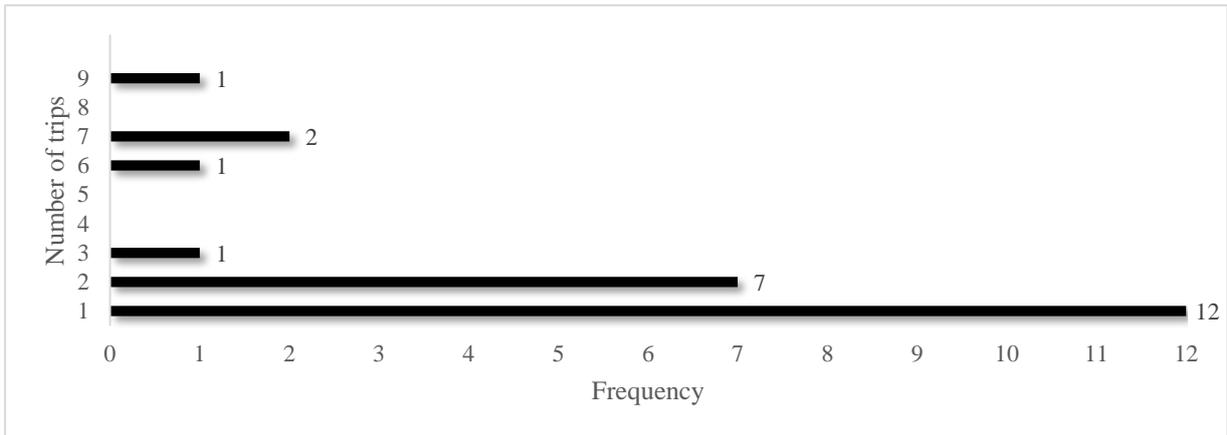
Als dank voor het invullen van de vragenlijst willen wij u **één uur gratis deelautogebruik** aanbieden in een van onze deelauto's. Als u hiervan gebruik wilt maken kunt u aan het einde van de vragenlijst uw e-mailadres achterlaten waarna Century dit gratis uur automatisch aan uw account toevoegt!

U kunt de vragenlijst invullen door op de volgende link te klikken:

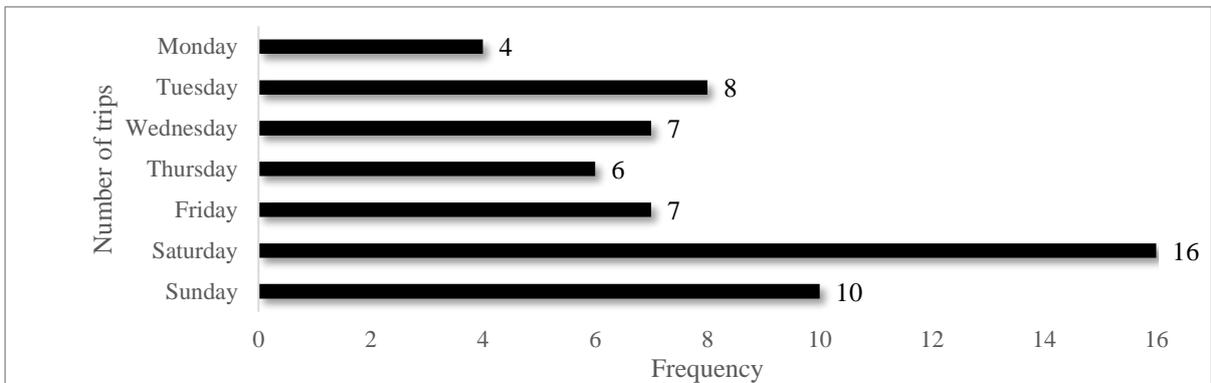
https://rug.eu.qualtrics.com/jfe/form/SV_004Hj1XxJhutINM

Hartelijk dank voor uw medewerking,
Century Autogroep

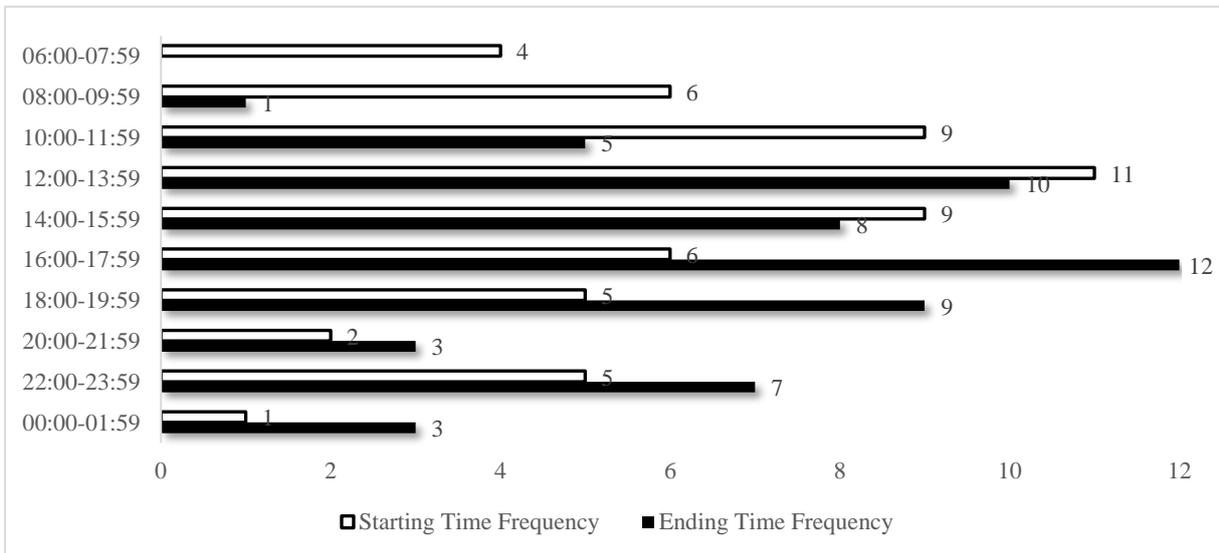
Appendix 7.2. Background figures chapter 4.2.



Number of trips per individual user.



Number of trips per day of the week.

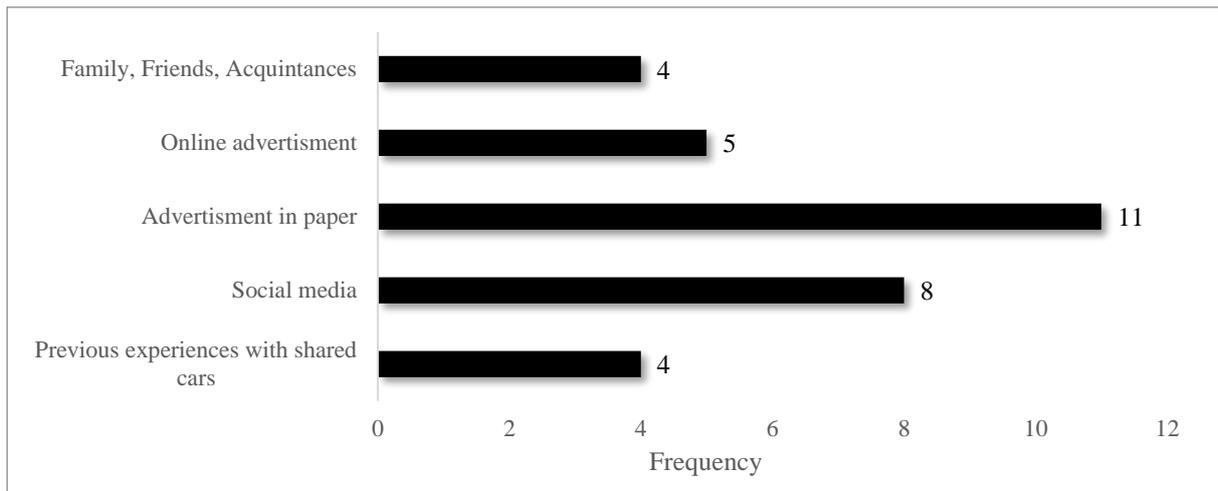


Frequency of trips set out by starting and ending time of the trip.

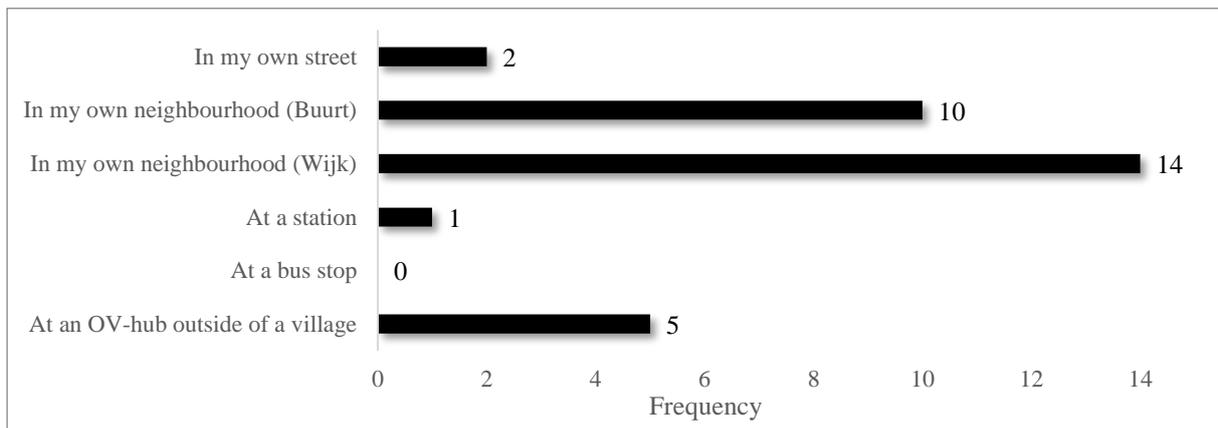
	Octo ber 22	Novem ber 22	Decem ber 22	Janu ary 23	Febru ary 23	Marc h 23	Apri l 23	Jul y 23	Augu st 23	Septem ber 23
Gieten	4	5	8	2	6	2	0	0	0	0
Eelde	N.A.	0	11	4	0	N.A.	N.A.	0	0	-
Hoogez and	N.A.	N.A.	0	3	0	5	N.A.	0	2	2
Annen	N.A.	N.A.	N.A.	0	3	1	0	0	0	0
Zuidlar en	N.A.	N.A.	N.A.	N.A.	N.A.	0	0	N. A.	N.A.	N.A.
Total	4	5	19	9	9	8	0	0	2	2

Number of trips per location per month. N.A. means that the car was not available at the location for the specific month.

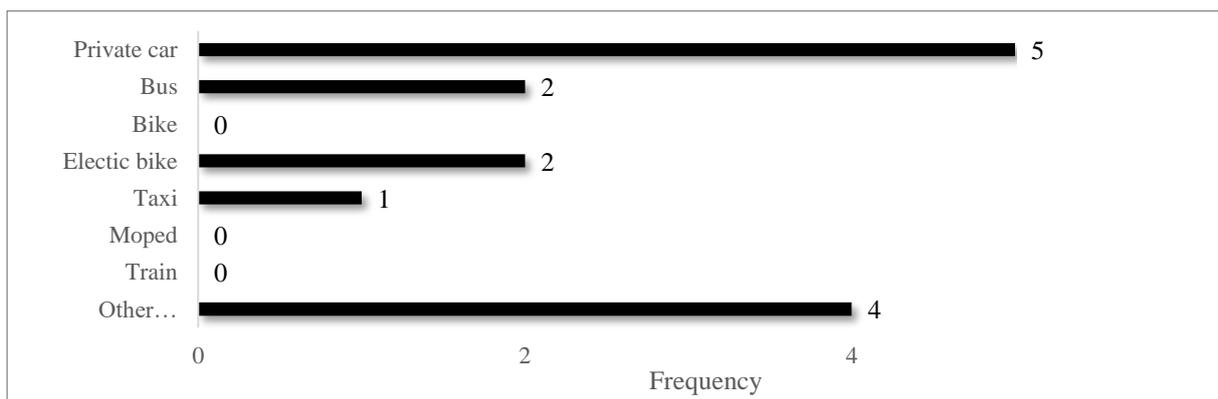
Appendix 7.4. Background figures chapter 4.3.3.



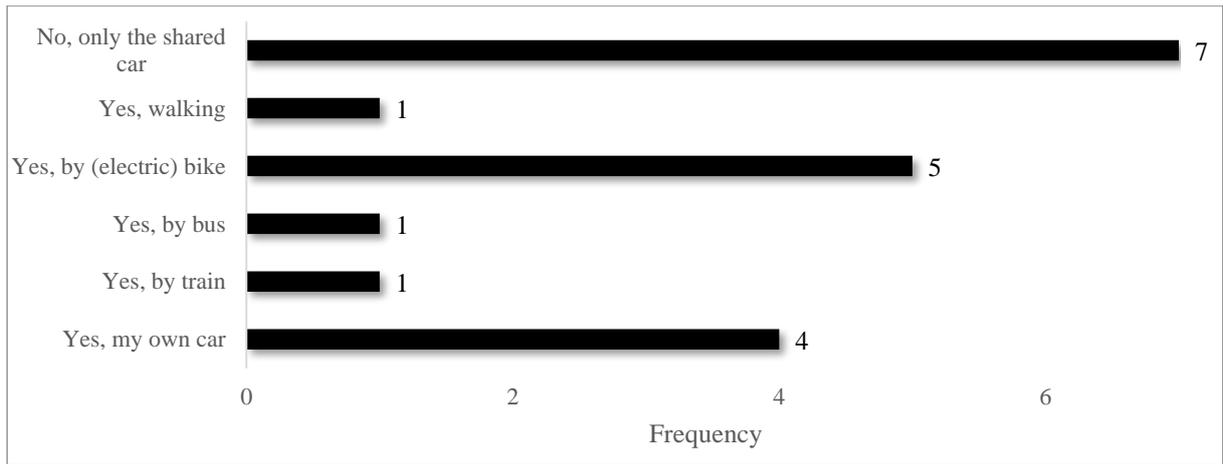
Result of question: How did you become familiar with our shared cars? (N=32).



Result of question: Where should a shared car be stationed according to you? (N=32).



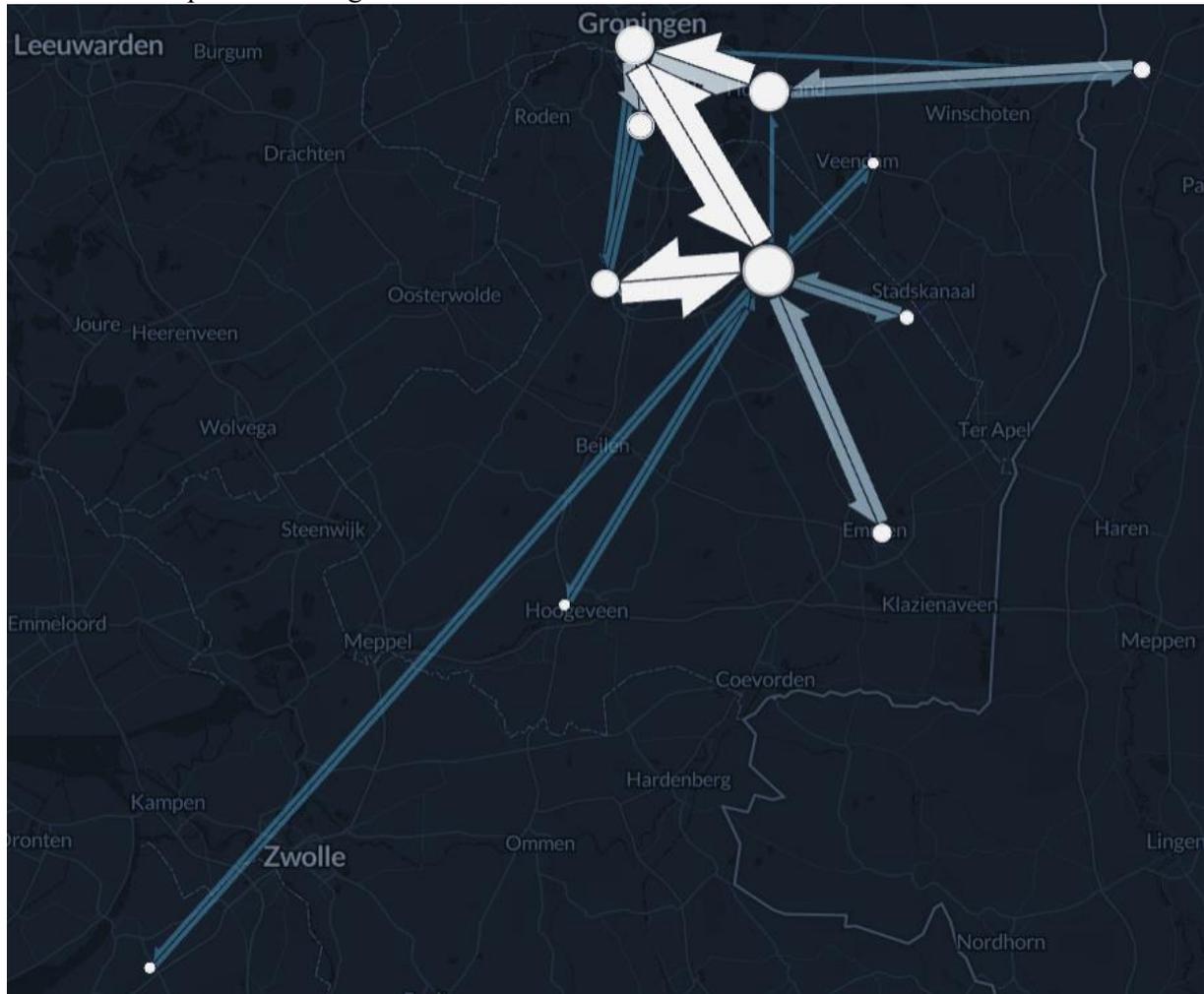
Result of question: Which mode of transport would you have used if you had not used the shared car for your trip? (N=14). Other:



Result of question: Have you travelled with other modes of transport in your trip besides the shared car? (N=14).

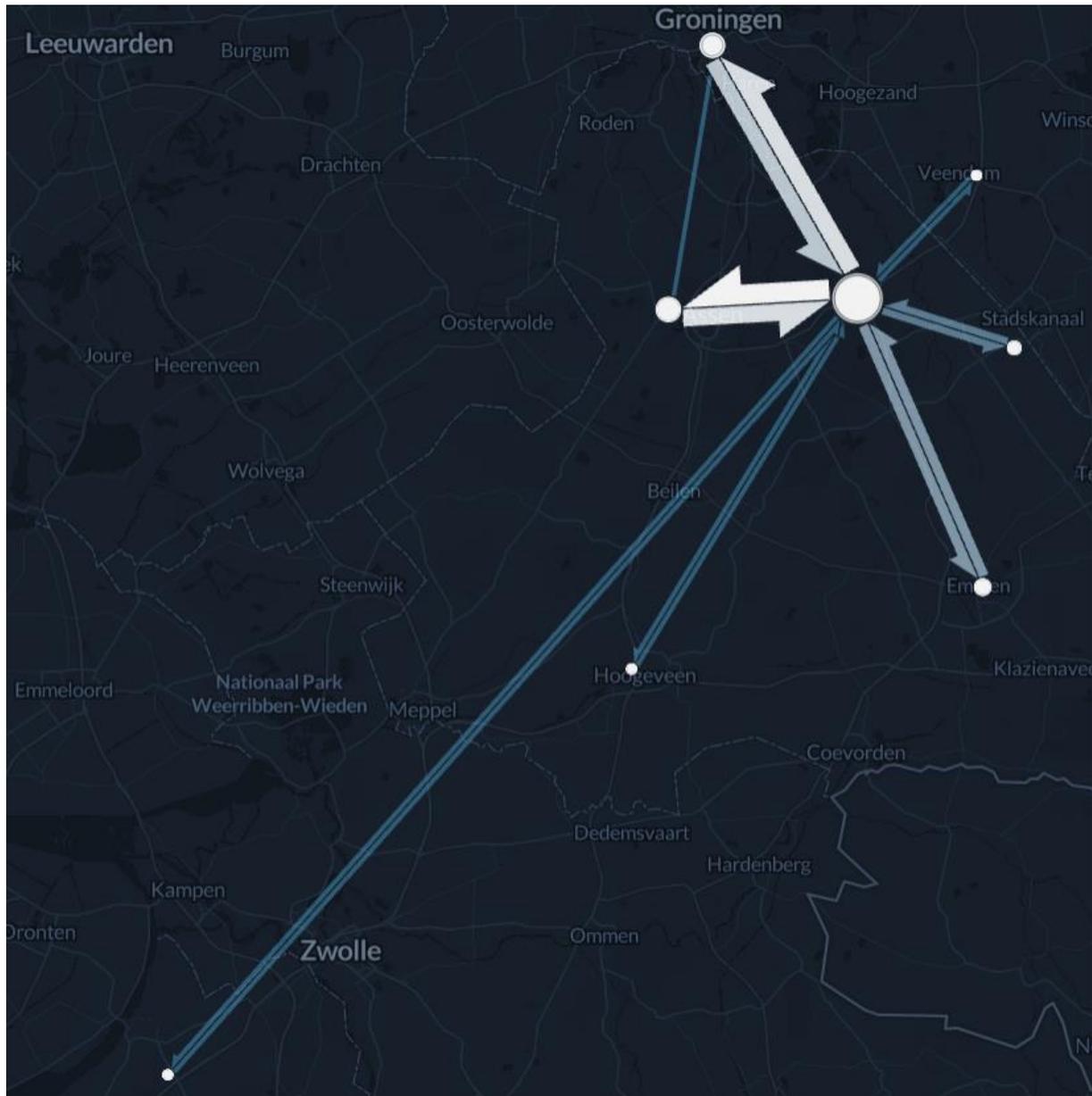
Appendix 7.5. Flowmaps of the rides

All rides in the pilot Hondsrug Noord:



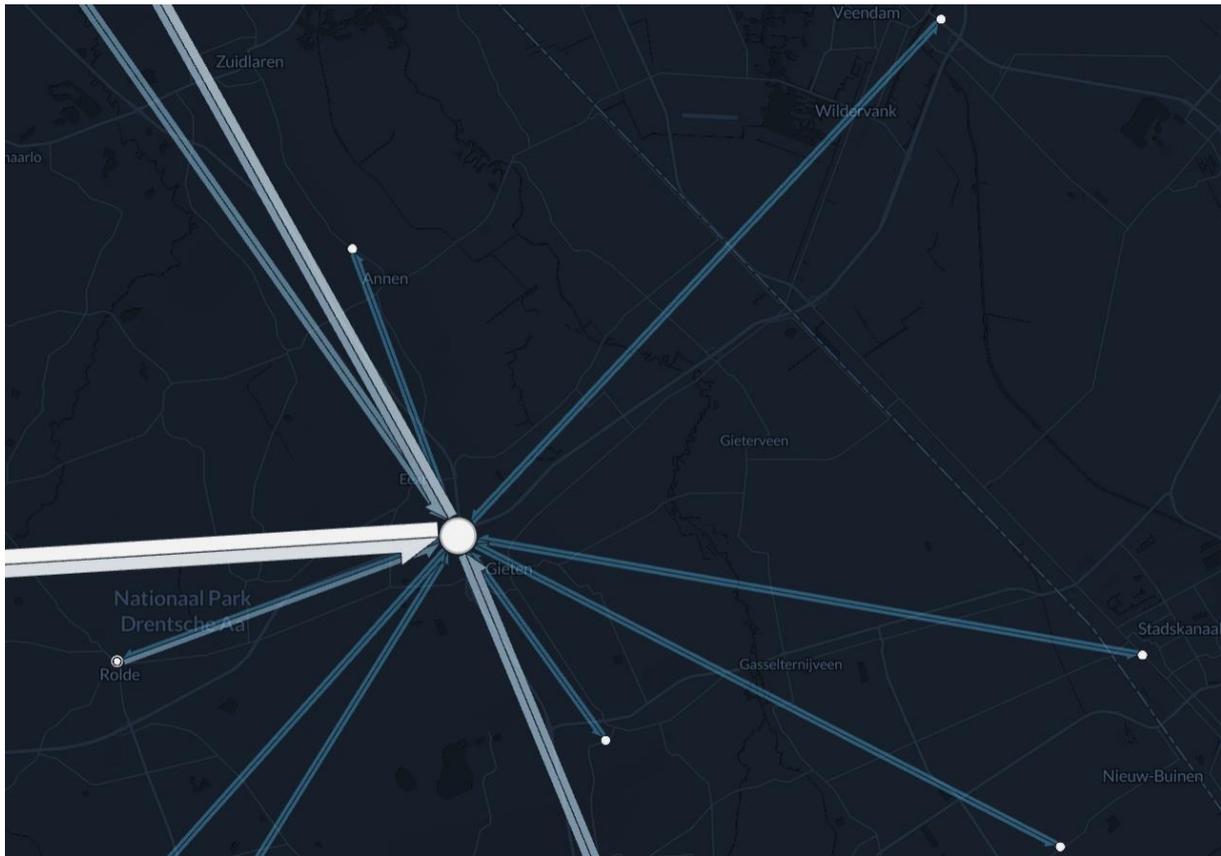
Color clarification: White arrows indicate flows that are most common, blue flows are made only once. The different tones of grey indicate flows that are made more than once but are not the most common flows. The more grey a flow gets, the more often that flow was present in the dataset.

All rides with the shared car in Gieten:



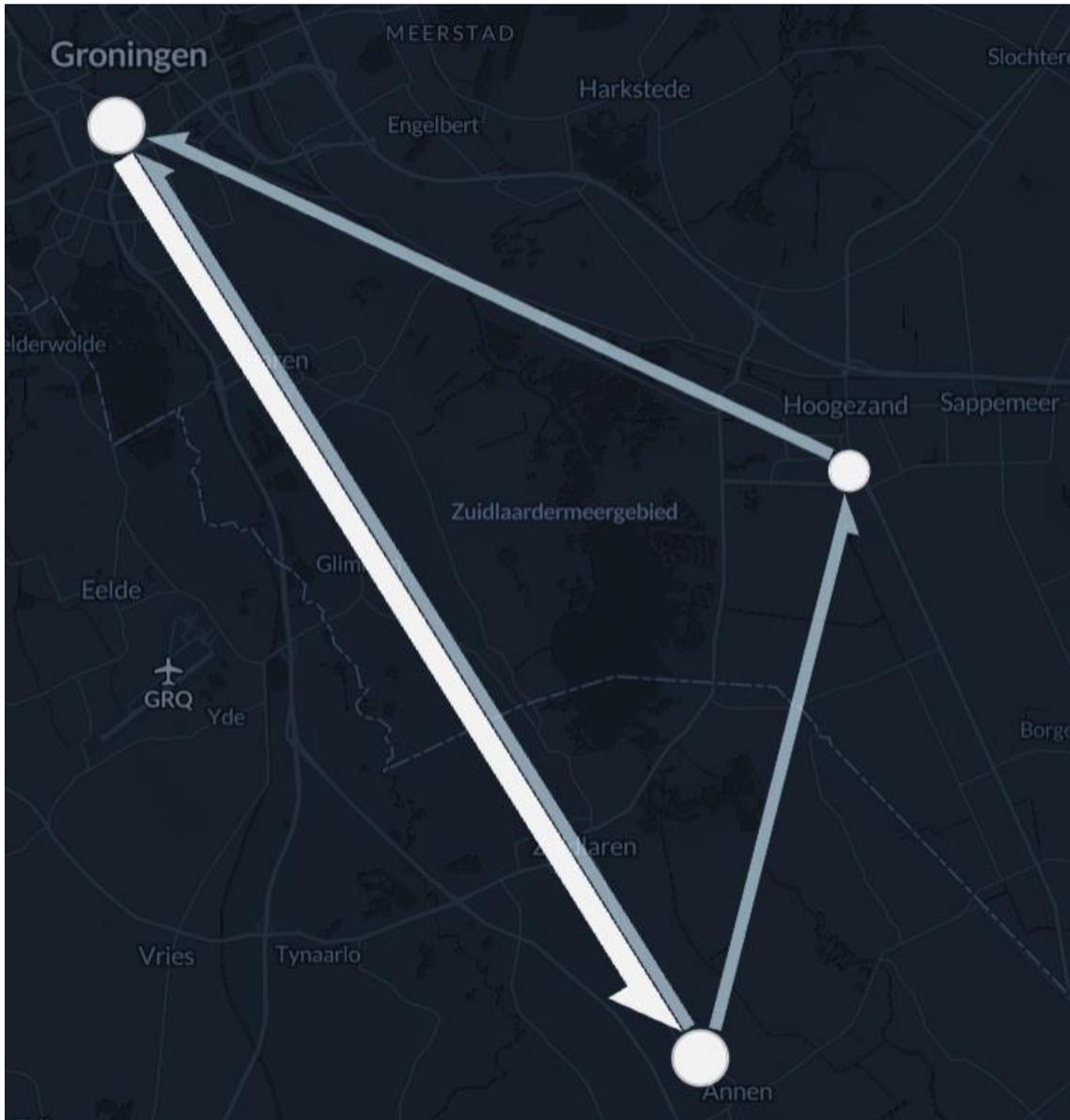
Color clarification: White arrows indicate flows that are most common, blue flows are made only once. The different tones of grey indicate flows that are made more than once but are not the most common flows. The more grey a flow gets, the more often that flow was present in the dataset.

All rides with the shared car in Gieten zoomed in:



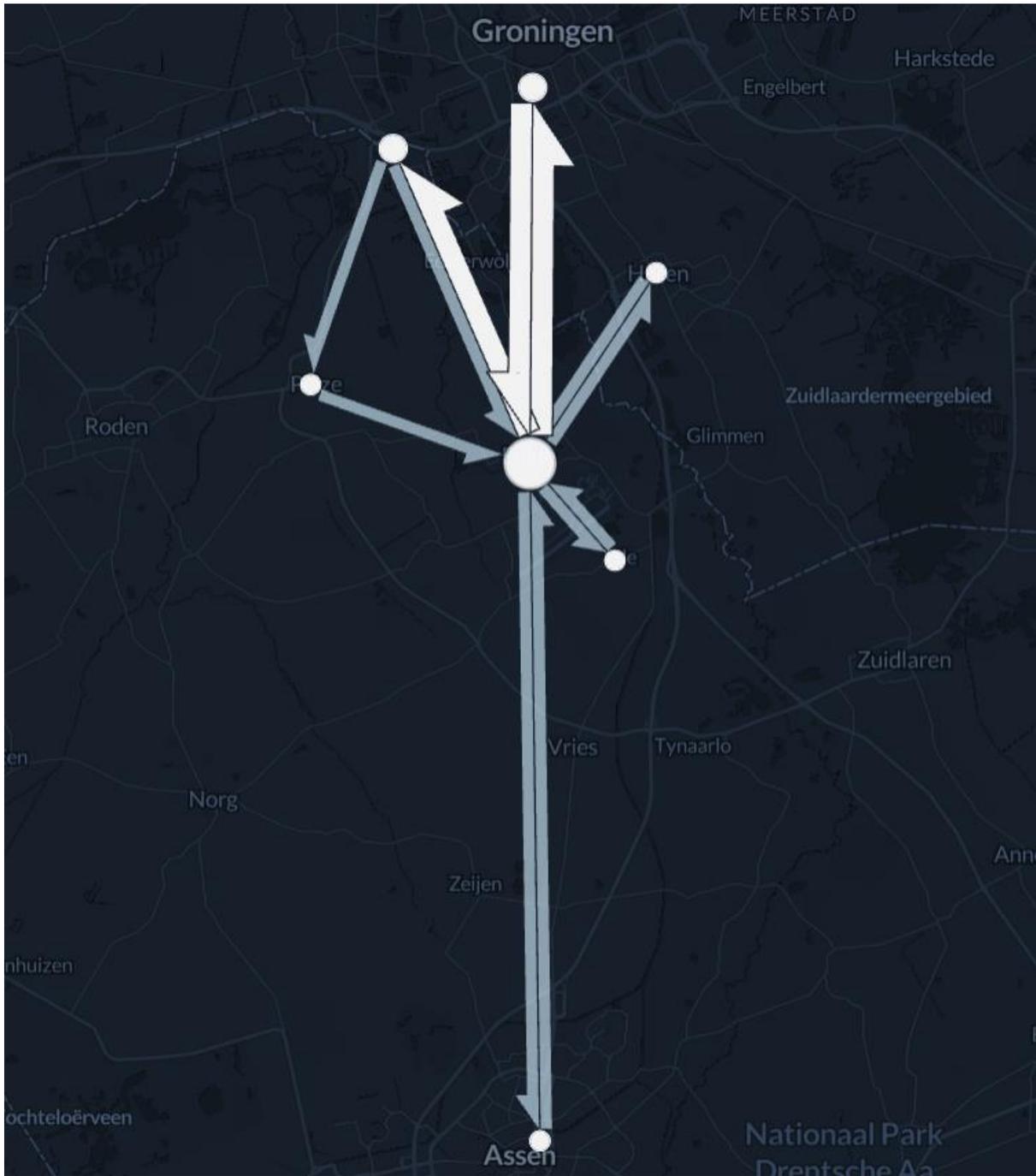
Color clarification: White arrows indicate flows that are most common, blue flows are made only once. The different tones of grey indicate flows that are made more than once but are not the most common flows. The more grey a flow gets, the more often that flow was present in the dataset.

All rides with the car in Annen:



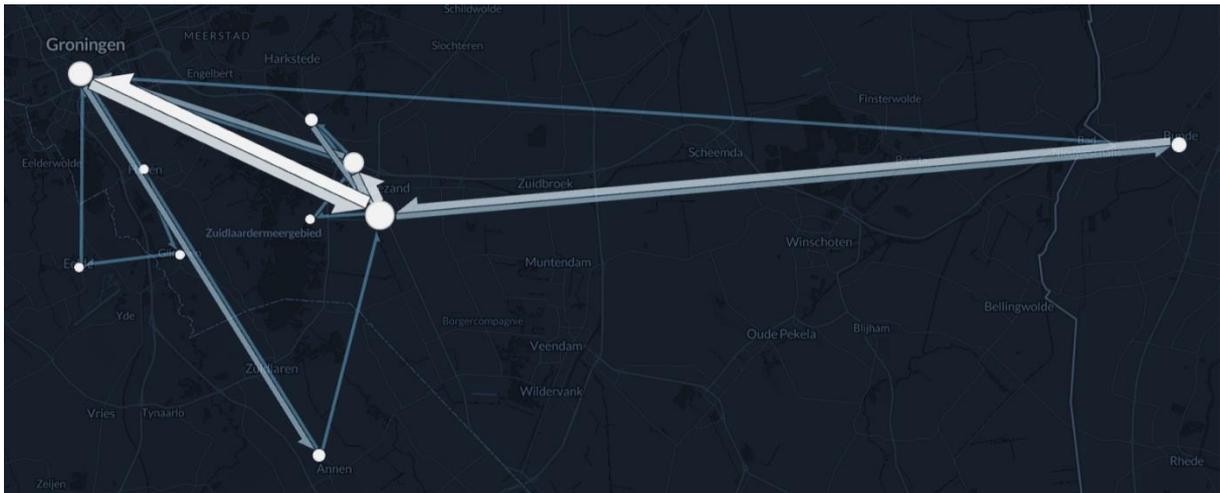
Color clarification: White arrows indicate flows that are most common, blue flows are made only once. The different tones of grey indicate flows that are made more than once but are not the most common flows. The more grey a flow gets, the more often that flow was present in the dataset.

All rides with the car in Eelde:

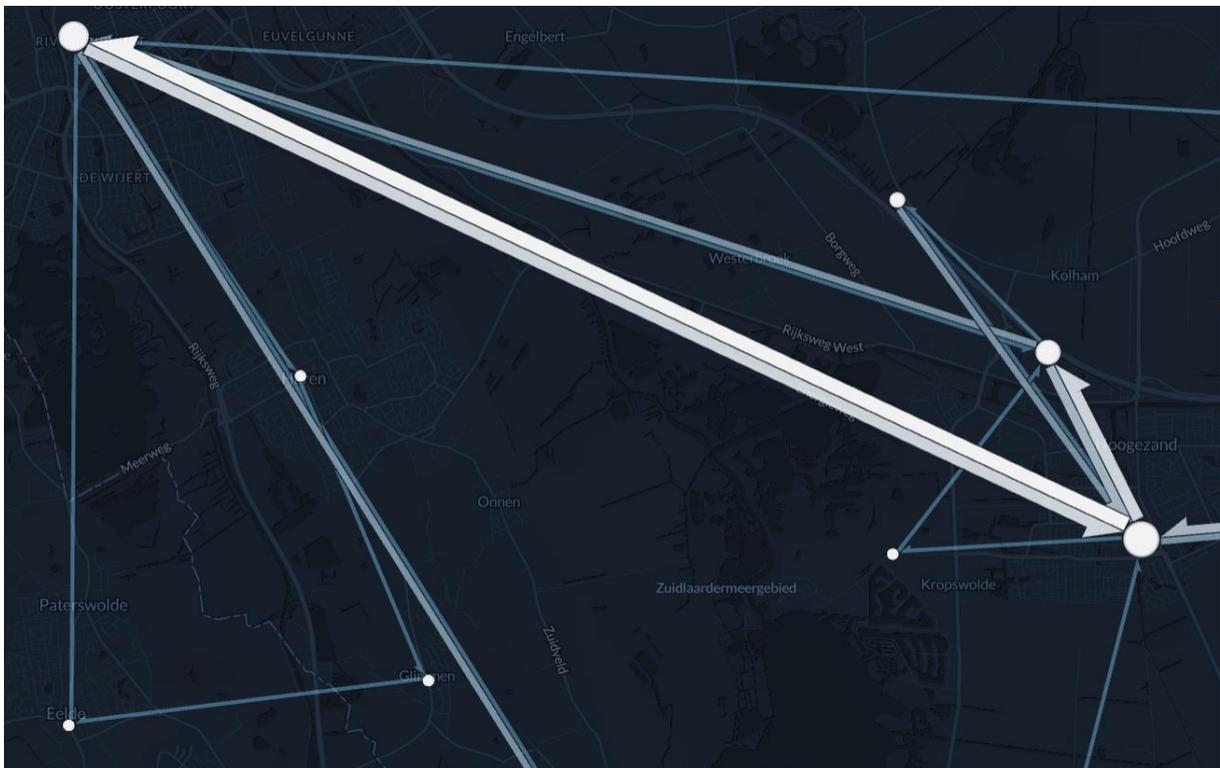


Color clarification: White arrows indicate flows that are most common, blue flows are made only once. The different tones of grey indicate flows that are made more than once but are not the most common flows. The more grey a flow gets, the more often that flow was present in the dataset.

All rides with the car in Hoogezand:



All rides with the car in Hoogezand zoomed in:



Color clarification: White arrows indicate flows that are most common, blue flows are made only once. The different tones of grey indicate flows that are made more than once but are not the most common flows. The more grey a flow gets, the more often that flow was present in the dataset.

Appendix 7.6. Statistical tests

Chi Square results for education level.

Shared car usage by education level, observed:

	LTS	Havo	HBO	WO	Total
Yes	1	4	5	4	14
No	0	3	8	7	18
Total	1	7	13	11	32

*Answer category "lagere school" is excluded as there were no respondents in this category.

Shared car usage by education level, expected:

	LTS	Havo	HBO	WO	Total
Yes	0,4375	3,0625	5,6875	4,8125	14
No	0,5625	3,9375	7,3125	6,1875	18
Total	1	7	13	11	32

Chi-square test results for education level:

Degrees of freedom	3
Critical value	7,815
X ²	2,1875

Chi square test results for occupation.

Shared car usage by occupation, observed:

	Working	Studying	Retired	Without a job	Other	Total
Yes	10	1	2	0	1	14
No	13	1	1	2	1	18
Total	23	2	3	2	2	32

Shared car usage by occupation, expected:

	Working	Studying	Retired	Without a job	Other	Total
Yes	10,0625	0,875	1,3125	0,875	0,875	14
No	12,9375	1,125	1,6875	1,125	1,125	18
Total	23	2	3	2	2	32

Chi-square test results for occupation:

Degrees of freedom	4
Critical value	9,488
X ²	2,2599

Chi square test results for gender.

Shared car usage by gender, observed:

	Male	Female	Total
Yes	10	3	13
No	10	8	18
Total	20	11	31

*One respondent was excluded as they indicated that they answered "zeg ik liever niet" for their gender.

Shared car usage by gender, expected:

	Male	Female	Total
Yes	8,3871	4,6129	13
No	11,6129	6,3871	18
Total	20	11	31

Chi-square test results for gender:

Degrees of freedom	1
Critical value	3,841
X ²	1,5054

Chi square test results for preferred parking location.

Shared car usage by preferred parking location, observed:

	Neighbourhood	Ov hub	Station	Street	Total
Yes	10	1	1	2	14
No	14	4	0	0	18
Total	24	5	1	2	32

*Answer category "bus stop" was excluded as there were no respondents in this category.

Shared car usage by preferred parking location, expected:

	Neighbourhood	Ov hub	Station	Street	Total
Yes	10,5	2,1875	0,4375	0,875	14
No	13,5	2,8125	0,5625	1,125	18
Total	24	5	1	2	32

Chi-square test results for preferred parking location:

Degrees of freedom	3
Critical value	7,815
X ²	5,0455

Chi square test results for familiarity with the pilots shared cars.

Shared car usage by familiarity with the pilots shared cars, observed:

	Social media	Via family, friends or acquaintances	Via a newspaper ad	Previous experience	Via an online ad	Total
Yes	3	1	6	1	3	14
No	5	3	4	3	3	18
Total	8	4	10	4	6	N=32

Shared car usage by familiarity with the pilots shared cars, expected:

	Social media	Via family, friends or acquaintances	Via a newspaper ad	Previous experience	Via an online ad	Total
Yes	3,5	1,75	4,375	1,75	2,625	14
No	4,5	2,25	5,625	2,25	3,375	18
Total	8	4	10	4	6	32

Chi-square test results for familiarity with the pilots shared cars:

Degrees of freedom	4
Critical value	9,488
X ²	2,4381

Kruskal Wallis test for age.

Test summary of usage of the pilots shared cars by age

Degrees of freedom	1
N	32
Sig.	0,470

Age dispersion of users of the shared cars:

