

Zuidas meets MaaS

Perspectives of both employees and employers in the Zuidas area
towards shared mobility and the influence on MaaS



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Preface

After a very instructive study time, when completing this thesis, my student days came to an end after four years. I look back on this with great pleasure, satisfaction, and gratitude. Given my interest in maps, spatial planning, and transport since an early age, I chose the bachelor Human Geography & Spatial Planning at the University of Utrecht after completing high school. Here I was able to develop my general research skills, but also knowledge about urban planning and GIS. To find out the depth in the field of mobility, I started the minor in Transport, Infrastructure & Logistics at TU Delft. An interesting period in which more was learned about the economic factors of transport, network planning, and feasibility studies for new infrastructure projects. During one of the guest lectures, the concept of "Mobility as a Service" was introduced. This new mobility concept immediately earned my interest. After completing my bachelor's degree, I wanted to take the opportunity to grow and in view of my interest in transport, I chose to study Spatial Planning with a specialization in Urban and Regional Mobility at Radboud University. A choice that I still look back on with satisfaction.

In addition to the activity surrounding this thesis, I have now been working as a Product Explorer at Radiuz for over a year and a half. Radiuz offers a complete and integrated mobility solution for employers, including its own mobility card, portal, and app in order to always have access to all forms of mobility. In my position as Product Explorer I support various initiatives aimed at transport solutions, such as the MaaS pilot at the Zuidas in Amsterdam. I have been involved in the project since the first round of the tender. In the summer of 2019, it was announced that the pilot was awarded to us, a consortium consisting of several companies. I experience being closely involved in the MaaS pilot, which was one of the most important reasons for this research, as extremely educational and challenging. I have already been able to apply the knowledge that I gained while writing this thesis in the professional field. Conversely, this combination has shown me that MaaS not only exists on paper but will actually be rolled out. All this with the aim of offering one integrated multimodal travel app called Amaze in order to make travel by public transport and shared mobility more attractive.

I would like to thank my thesis supervisor Sander Lenferink for supervising this research. At crucial moments, he helped me focus my interest in MaaS in order to conduct useful research. In addition, his quick and constructive feedback contributed to a pleasant working atmosphere. Until the moment of submission, I enjoyed working on this thesis, despite the necessary thresholds. My thanks also go to Jan Hollander, who supported me from Radiuz in drawing up a thorough proposal and in finding the right respondents in the Zuidas. In addition, I want to thank Jef Heyse for his insight and supervision from both Radiuz and Amaze. His passion, drive, and willpower can be called admirable and motivate me every day.

Although given the circumstances, it was not always easy to recruit the right respondents, I am very grateful that a number of people wanted to take the time to speak to me frankly. That is why I want all respondents here; thank the employees, employers, and experts for their contribution to the study. Finally, I have nothing more to do than to wish you a lot of reading pleasure!

Matthias van Aalst
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Abstract

This research focuses on the attitude and intention of both employees and employers in the Zuidas area in Amsterdam, and the adaptation of Mobility as a Service. The municipality of Amsterdam has expressed the wish for the realization of MaaS by setting up a competition for MaaS Zuidas (Gemeente Amsterdam, 2018). This research is designed using the Theory of Planned Behavior (Ajzen, 1991); which occurs to be an excellent predictor of sustainable mobility. Since MaaS currently isn't operational yet, this study has worked with the main distinguishing features of MaaS - the integration of shared mobility into one personal travel planner. The main shared mobility options at the moment are shared bicycles, shared cars, and shared e-scooters. The advantage of this approach is that these services have already been rolled out in Amsterdam and on the Zuidas specifically, where the application called Amaze will be a MaaS-provider. Interviews were conducted to investigate the current attitude towards shared mobility among both employees and employers, their intention to use it, and the opportunities of MaaS. This study showed that employees and employers generally receive shared mobility positively. Ajzen (1991) states that the more positive the attitude towards behaviour, the stronger the intention of an individual to display the considered behaviour use. This positive attitude is mainly expressed in a positive opinion about the sustainable mode of transport and the flexibility that shared mobility offers. The negative attitude is caused by high costs, low reliability, and familiar habitual behaviour. Conditions for a higher intention would be greater flexibility, a specific location for shared mobility nearby, more travel options and greater nationwide coverage. The relationship with the potential adaptation of MaaS is initiated by the high appreciation of personal travel advice and the fact that MaaS is delivered as one app instead of multiple and provides travel insights of employees for the employer. The needs, wishes, requirements could be used when motivating the target group of Amaze, which will be a MaaS provider in the Zuidas area. Regarding shared mobility, there are no studies known so far that specifically address employees and employers, with the addition of experts. Based on the Theory of Planned Behavior this thesis will gather knowledge about this.

Keywords: Mobility as a Service (MaaS) - Shared Mobility - Shared cars - Shared bicycles - Shared E-Scooters - Zuidas - Amsterdam – Mobility policy - Theory of Planned Behavior (TPB)

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1. Introduction to the research

1.1. Research problem statement

1.1.1 Growing demand

The Dutch Planbureau voor de Leefomgeving (n.d.) states that in recent years cities have become cleaner, safer, and more liveable. At the same time, the pressure on the city is increasing with the growth of residents and visitors. In particular, in the four major cities (Amsterdam, Rotterdam, The Hague, and Utrecht) the population is expected to continue to increase until 2030 (CBS, 2016). It is predicted that these cities will have about 15% more inhabitants in 2030 than in 2015. Even if the national population growth decreases, the cities in the Randstad will likely continue to grow. In 2018, Amsterdam grew the fastest of all Dutch cities with almost 10,000 inhabitants more than in 2017 (CBS, 2019). As a result, the demand for housing is greater than the supply, and house prices are becoming higher and even unaffordable for more people (Gemeente Amsterdam, n.d.). In addition, there is increasing pressure on the physical living environment (Rode, 2013) and mobility. It is becoming busier in public transport, on bicycle and pedestrian paths, and motorways. Especially the latter leads to (increasingly) air pollution with additional traffic jams.

Mobility, an important facet within our contemporary society, is under pressure. Due to the growing demand for mobility and the limited space in the Netherlands, the limits of mobility are reaching. This is not only apparent from the figures (KiM, 2017), but it is also noticeable in daily life (Van Teeffelen, Onkenhout & Vlek, 2017). Travelers experience the mobility problem and expect that it will only increase in the coming years. Till 2040 up to 56 billion euros must be made available for additional investments in the Dutch infrastructure of public transport, roads, and waterways. From 2020, that amounts to almost 3 billion euros per year (Duursma & Verlaan, 2019). The investment serves several purposes: more capacity, more safety, more innovation. It is also necessary to make the energy transition in transport possible and to achieve climate goals (Duursma & Verlaan, 2019). The forecast is that our demand for mobility will only increase in the future. Despite growing investments in road infrastructure, the number of traffic jams and delays continues to increase (Van Zanten, 2017). The limits of the physical infrastructure are reached, which increases the need for alternative mobility concepts (Vliek, 2017).

1.1.2 A sustainable and integrated transport system

In the coalition agreement of October 2017, VVD, CDA, D66, and ChristenUnie sketch the following picture of their wishes for a transport system for the future:

“A smart and sustainable transport system whose parts connect seamlessly. In this way we want to keep the Netherlands mobile and accessible. Now that the economy is running well again, additional investment in infrastructure is needed and possibly to reduce the increasing pressure on the road, rail, water and in the air. At the same time, we are taking measures to limit the burden on the climate, air quality, and the living environment. Innovation offers enormous opportunities. Technological development offers the possibility of ultimately

achieving a more integrated transport system that is becoming increasingly cleaner”
(Rijksoverheid, 2017).

The Rutte III cabinet expresses the wish to invest in a sustainable and integrated transport system, where innovation offers enormous opportunities. In various groups, the concept of “Mobility as a Service” is mentioned as a possible solution for using public transport as a fully integrated system (Giesecke, Surakka & Hakonen, 2016). The term “Mobility as a Service” is later also named in the 2017 coalition agreement:

“We are adopting laws and regulations so that public transport and taxi companies can offer flexible and demand-oriented transport (“mobility as a service”). Provinces and transport regions that want to experiment with new forms of target group transport, public transport and subsystems will be given the space to do so” (Rijksoverheid, 2017).

1.1.3 Mobility as a Service

Often an extension of the road network or public transport is a response to the growing demand for mobility (Goodall et al., 2017). However, both interventions are expensive and slow and ensure a larger capacity of the infrastructure, which in the long term attracts more travellers. Currently, the transport market is still very fragmented and many transport systems operate only with specific modes of transport or only in certain regions (Goodall, Dovey, Bornstein & Bonthron, 2017). In recent years, various carriers have started offering mobility services such as shared bicycles or shared cars, but these have all been linked to different platforms and applications (Goodall et al., 2017). The strength of MaaS lies in connecting and integrating all these transport modalities and carriers into one clear overview. This is a conditional dimension of MaaS, since here the integrated transport offer can be presented to the user of the platform. MaaS may be a possible solution to the dilemma of tackling current mobility issues (Goodall et al., 2017). The increase in the use of other modes of transport must, however, be well facilitated: this is another important task within mobility policy. “At its core, MaaS relies on a digital platform that integrates end-to-end trip planning, booking, electronic ticketing, and payment services across all modes of transportation, public or private” (Goodall et al., 2017, pp. 114). Currently, the most popular mode of transport is the (private) car, but that may change when Mobility as a Service takes effect (Comtrade, 2017). “Mobility-as-a-Service” (MaaS) is a new perspective on mobility in which the traveller travels from A to B without having to own modes of transport (Connekt, 2017). The traveller orders his or her transportation via a platform on which different carriers and market parties can be active. At MaaS, the traveller is central and the aim is to strike a balance between supply and demand for mobility by offering the most suitable offer of transport to the user of a MaaS platform. It gives mobility a different dimension by no longer focusing on the “ownership” of modes of transport, but the “use” of them. This creates a more flexible form of mobility (Jittrapirom, Marchau & Meurs, 2018). This can be called an interesting development since it means that there is less need for having your own car, which ultimately reduces the pressure on the road network.

Hietanen (2014), the CEO of a Finnish company that offers the MaaS concept, was one of the first to define MaaS. He describes MaaS as: “Mobility as a Service (MaaS) is a mobility distribution model in which a customer's major transportation needs are with over one interface and are offered by a service provider. Typically, services are bundled into a package similar

to mobile phone price-plan packages”. This definition underlines the importance of combining services and putting together a personalized “mobility package” through one provider. Another word statement from MaaS is from Atkins (2015), which focuses more on the comprehensive system: “A new way to provide transport, which facilitates users to get from A to B by combining available mobility options and presenting them in a completely integrated manner”. In this description, the emphasis is on a multimodal and integral mobility offer for the traveller.

In the current situation, the traveller needs a separate app for each mode of transport and that they work separately. Consider, for example, a separate NS travel planner for the train, a Greenwheels app for the shared car, a Donkey Republic app for the shared bicycle. As a result, the potential traveller loses the overview and therefore the low threshold of modalities other than the own car. The acceptance of MaaS, therefore, consists of the use of one app in which the various mobility services are integrated. In this app you can plan, book, travel, and pay. MuConsult (2017, pp.4) states about MaaS: “MaaS provides for the provision of flexible, partly demand-driven multimodal mobility services whereby tailor-made integrated travel options are offered to travellers via a digital platform”.

One of the most important pillars of MaaS is the integration of shared mobility in a multimodal travel app. Shared mobility means a mobility service whose modes of transport is not in private ownership but is shared with other users. Various initiatives are already active in the Netherlands, such as:

- shared cars: GreenWheels, MyWheels, Snappcar, Car2Go, StudentCar, ConnectCar, GoAbout, Amber
- shared bicycles: OV bicycle, Hello Bike, Mobike, Donkey Republic, Flickbike, GoBike, GoAbout, Xbike, KeoBike
- shared e-scooters: Felyx, Check, Juuve, GoSharing

Examples of mobility services with shared cars in the Netherlands are Car2Go and Greenwheels. The Car2go initiative is active in several big cities in Europe and the USA, and in the Netherlands, Car2Go is only operational in Amsterdam and is called ShareNow for a short period (Car2Go, 2019). Users can pay per use and there is no need for purchasing a subscription (Ramaer, 2017). Greenwheels has approximately 1850 locations within the Netherlands; there people can pick up and return the shared cars. In the app, people can make a reservation, open the car by checking in the Greenwheels card. Then it is possible to take the key from the dashboard to begin the ride. It is only allowed to leave the car on the initial parking spot when the ride ends (Greenwheels, n.d.).

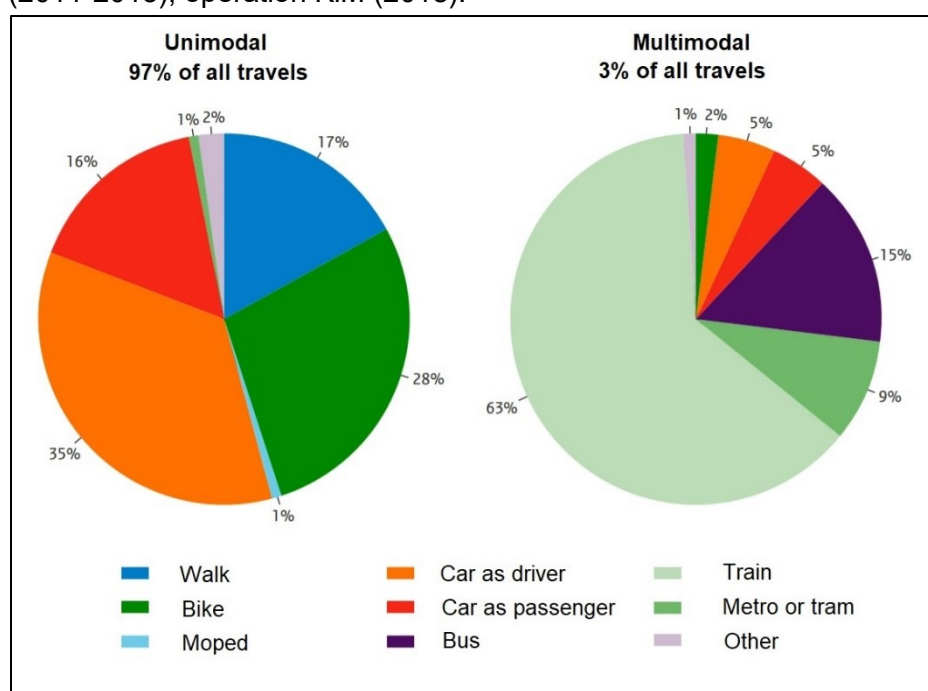
In addition to shared cars and shared bicycles, the list of modes of transport also includes shared e-scooters. These shared e-scooters are rising in popularity in Amsterdam, The Hague, and Rotterdam. GoSharing and Check are in service in Rotterdam and a growing number of other places (Check, n.d; GoSharing, n.d). Another one is Felyx; a shared e-scooter system for which customers can pay per minute. Travelers can reserve and use the available electric e-scooters. Afterward, users can leave the e-scooter everywhere in the designated areas for another traveller to use it (Felyx, n.d).

While in many cases public transportation offers an substitute to private cars, bicycles, and scooters, it cannot solve all mobility needs. Diverse modes of transport such as shared cars, shared bicycles, and shared e-scooters can offer a solution to where the public transport

system is lacking. In addition, this shared mobility in itself also offers some profits. There is sufficient confirmation about the constructive results of shared mobility. For example, there is evidence that carsharing programs significantly reduce VMT (Vehicle Miles Traveled) (Martin et al., 2010; Clewlow, 2016). Sharing bicycles can also have positive effects on the use of private vehicles (Fishman et al., 2014). In many cases, there is a trade-off between purchasing a vehicle yourself and sharing it, leading to a general decrease in private vehicle ownership (Clewlow, 2016; Shaheen et al., 2009; Fishman et al., 2014). In addition, shared modes have demonstrated several health and environmental advantages. Fuel consumption of shared cars is more economical than of private cars because people share the car with several people (Martin et al., 2010). Regarding to Chen and Kockelman (2016), and Martin et al. (2010) car sharing can potentially lead to a substantial decrease of CO₂-emissions per user because of the reduction in VMT. Chen and Kockelman (2016) ascertained that CO₂-emissions are reduced by about 51% if car users participate in a shared car initiative.

Various transport modalities are included in a MaaS concept. Preferably as much as possible, such as different forms of public transport, taxis, shared cars, shared bicycles, shared e-scooters. It is, therefore, a multimodal offer of collective and individual mobility services, but it can also concern shared use of own modes of transport. The point is that door-to-door relocation is possible through various forms of transport. In this way, a traveler is 'unburdened' as much as possible. Different travel options are provided for such door-to-door movements. These can differentiate in terms of the composition of modalities (Grotenhuis, Rietveld & Wiegman, 2007). Travelers can easily compare different fares and travel options and then have the option to choose this trip. Because the traveller has access to all these mobility services, he/she does not in principle need to own any vehicles. Figure 1.1 shows the main modes of transport for unimodal and multimodal movements and shows that multimodality increases with the movement distance. It should be borne in mind that only 10 percent of all journeys are longer than 30 kilometres.

Figure 1.1 Main modes of transport for unimodal and multimodal journeys. Source: CBS-OViN (2011-2013); operation KiM (2018).



To get people out of the own car, the literature shows that it is the attitudes towards ownership in particular that need to change (Mully 2017; KiM 2018). Car ownership often has an association with autonomy and freedom about public transport and sharing and rental services (Karlsson et al., 2016). According to Mully (2017), it is the MaaS solution that can lead to new attitudes that in turn can lead to new travel behaviour. Mully (2017) further argues that if a change in cultural preferences can be achieved - “and that must be more than a 'hype' to do this” - then MaaS solutions have the ability to reform the way people travel and live in change cities. Mobility choices are often influenced by fixed cultural practices. The role of attitudes is those travel decisions are not always rational anyway: emotions (KiM, 2017; De Vos & Witlox, 2017) and symbolic and affective factors (Steg & Vlek, 2009) also play a role in the choice of which transport modes to choose.

As with other innovative systems, however, a major change in mindset must be made if a MaaS network is to be developed. For a successful rollout, this change of mindset should not only come from policymakers but also the minds of potential users (Daniels & Mulley, 2012). For example, a properly functioning MaaS network must have large amounts of data from every user. However, this can affect the privacy of users since this way the data about their travel behaviour is shared with the transport providers (Callegati, Gabbrielli, Giallorenzo, Melis & Prandini, 2017).

1.1.4 Urban mobility

Urban areas, such as the Amsterdam Metropolitan region, play an important role in the Dutch economy. An urban area is identified by a high population density and usually a accumulation of facilities and economic activities (CBS, 2020; De Groot, 2014). The urban economy is more productive, grows faster economically, and has a greater innovative capacity than the economy in non-urban areas (Raspe, 2012, in RLI 2012). The accessibility of living and working places, facilities, and other places where people want to carry out activities in urban areas are of great importance for the functioning of daily life (RLI, 2016). Good accessibility also contributes to the international competitive position of cities and thus the national economy (ROMagazine, 2012). Accessibility is about the extent to which people can do activities at different locations and at different times (Geurs, 2014). The accessibility of urban areas is currently under pressure. Increasing urbanization and an improving economy are causing cities to clog up with road traffic, resulting in an increase in travel time and a decrease in air quality (Financieel Dagblad, 2016). In addition to economic effects, this is also at the expense of the quality of life. Also, one could speak of under-capacity in public transport, especially during peak hours. Due to the scarcity of space in urban areas and an increase in traffic, expansion of road and rail infrastructure is very difficult. The only possible solution is to use the available infrastructure more efficient. In theory, MaaS could provide this solution.

1.1.5 MaaS pilot Zuidas

The municipality of Amsterdam has expressed the wish for the realization of MaaS by setting up a competition for the MaaS Zuidas mini-competition (Gemeente Amsterdam, 2018). This is part of several pilots that are being deployed throughout the Netherlands from the Ministry of Infrastructure & Water Management.

A few years ago it was not clear who would start the process of implementing MaaS and whether this would happen at all (De Verkeersonderneming, 2016). The Dutch Mobility-as-a-Service action plan was published in 2017 (Connekt, 2017). This document can be seen as the start of a wider inclusion of MaaS in the Netherlands. It presents the most important ideas and challenges of MaaS. In addition, it shows that there is a wide variety of MaaS-like applications: from an app that provides sharing mobility in a multimodal real-time service to experimenting with mobility budgets for employees to use multiple modes of transport (Connekt, 2017).

The choice for the Zuidas has been made since this is the first pilot to be elected (Gemeente Amsterdam, 2018) and because this is an area where several big (international) companies are located. Through an employer's approach large numbers of travellers could be connected. In addition to Amsterdam, there are many other regional MaaS pilots and focus themes; Rotterdam (Rotterdam-The Hague Airport), Eindhoven (sustainability), Limburg (borderless mobility), Groningen-Drenthe (accessibility of rural areas), Twente (participation) and Utrecht-Leidsche Rijn (Vinex) (Ministry of Infrastructure & Water Management, 2018). It is essential here that the service offered by the MaaS operator quickly has a positive business case (Van Nieuwenhuizen Wijbenga & Van Veldhoven - Van der Meer, 2018). The potential of MaaS on the Zuidas is a lot greater than the other pilots since it is home to several large companies whose employees often use the (lease) car for daily commuting and business travel (Ministry of Infrastructure & Water Management, 2018). With large scale road improvement works that are planned for the coming years in the Zuidasdok project, expected is that the current infrastructure is not able to handle the demand. MaaS could provide the requirements of improved accessibility, employee satisfaction, sustainability, and flexibility (Rikken, 2019). MaaS can potentially be a worthy alternative for users of the (lease) car and also offer a better travel experience for public transport travellers. This is because shared mobility fits in well with each other and movements can be better distributed over time (Van Nieuwenhuizen Wijbenga & Van Veldhoven-van der Meer, 2018). The consortium consisting of OverMorgen (a consulting firm in the spatial domain), Amber (provider of shared electric cars), Transdev (one of the largest public transport companies in the world and in the Netherlands parent company of Connexxion) and Radiuz (provider of complete and integrated mobility solutions through an app, dashboard and mobility card) were awarded the tender in July 2019. It is planned that the full MaaS app called Amaze will be available within a specified time.

1.2 Research aim and research question(s)

The question remains, what are the push factors that can create wider support for MaaS? Two push factors are mentioned in the literature (Mully 2017). The first is the recognition that active travel (both walking and cycling) contributes to public health. MaaS has a positive effect on achieving greater physical activity among travellers, which improves overall health. MaaS offers a wide range of options for active travel, such as combinations with shared bicycles, which solve the first and last-mile problem. A second push factor is specifically related to the cities with high densities, such as Amsterdam, where the city is made more liveable by creating more space and tranquillity in the city where pro-active discouragement of the car is encouraged by reducing car-parking options. Change is already taking place at ridesharing, where annual growth can be seen in different parts of the world (Shaheen & Cohen, 2016). However, little is known about the motivational determinants that affect potential users'

intention to adopt MaaS. Especially for MaaS with its inherent tailor-made user experience, those insights are of significant importance.

This research can contribute to knowledge about the concept of Mobility as a Service in the Dutch context. This may include the needs, wishes, requirements of the early-adopters of Amaze. The biggest challenges for future MaaS providers are when it comes to motivating the target group to use the MaaS provider. This study will, therefore, serve as a step to gather knowledge about the attitude and intention towards shared mobility and the influence on the adaptation of MaaS.

Based on the information and research problem statement, the following main question has been formulated:

“To what extent do the attitude and the intention towards shared mobility of both employees and employers in the Zuidas contribute to adapt MaaS and how can its use be stimulated?”

This has been researched on the basis of the following sub-questions:

- *Which factors play a role in the attitude towards shared mobility?*
- *Which factors apply to the intention towards shared mobility and what conditions must shared mobility meet to make its use more attractive?*
- *Which elements determine the added value of MaaS?*

1.3 The scientific and societal relevance

1.3.1 Scientific relevance

Given the recent introduction of the concept and the low market share of MaaS, data on the adoption of this new service is scarce. The scientific research that has been published on this subject so far is aimed at investigating travellers' intentions to subscribe to MaaS and explore the potential market. Good examples of these studies are Ho et al. (2018), Kamargianni, Matyas & Muscat (2018), Strömberg, Karlsson, and Sochor (2018), Caiati, Rasouli and Timmermans (2020), in Australia, the United Kingdom, Sweden, and the Netherlands respectively. Their findings suggest that the adoption of MaaS depends on various factors, including service characteristics, social influence, socio-demographic characteristics, and travel patterns of individuals. Another question that is important for MaaS-providers such as Amaze, is which factors play a role in the demand for MaaS. Do determinants such as accessibility, spatial environment, and cost, urbanization level, density, and proximity influence the choice for MaaS? It is possible to measure individual preferences about the introduction of MaaS in the Netherlands (Caiati, Rasouli, and Timmermans, 2020). The purpose of this research is to provide insight into the effects of built-up factors on people's preferences for MaaS in the Zuidas case.

1.3.2 Societal relevance

There is a growing group of people living in cities that prefer to travel without a car. International studies show that in the more car-dependent cultures such as the US and

Australia, there is a general decline in car use and ownership (Delbosc & Currie, 2013; McDonald, 2015). Also, there is an ever-growing desire from society to live and to travel more sustainably. This is visible, for example, when considering the growth in the number of electric and hybrid cars (APTA, 2013). In addition, these studies show that the millennial generation has a different cultural view of personal car ownership. The car is seen much more as a practical means of getting from A to B quickly and much less associated with identity and freedom.

Because this research focuses on the factors that add value to the attitude towards shared mobility, it is, on one hand, tested whether MaaS will adjust among employees and employers in Zuidas. On the other hand, insight is gained into which factors determine the valuation of shared mobility. Based on the results, conclusions can be drawn about the applicability and design of a MaaS solution for the realization of the joint objectives. The conclusions can provide concrete tools for Radius and Amaze, but also for future parties who want to set up a MaaS product.

1.4 Reading Structure

The research is divided into eight chapters. In addition to the introduction, these are successive:

Chapter 2 *Theoretical framework*

In the first paragraphs of the theoretical framework, the Theory of Planned Behavior is discussed, and how this influences research on travel behaviour. Subsequently, determinants based on the attitude and intention towards shared mobility. After this, shared mobility and the connection between land use and mobility will be discussed. The Theoretical framework concludes with the conceptual model.

Chapter 3 *Methodology*

The third chapter focuses on research methods. It is discussed why explorative research has been elected, which is characterized by qualitative research methods. Within this thesis semi-structured interviews were conducted.

Chapter 4 *Context*

In this chapter, the current issues regarding shared mobility and MaaS mentioned in chapter 1 will be explained in more detail. The first section focuses on the current challenges on mobility from a national level to the Zuidas area and in the second section attention will be paid to the already completed MaaS pilots and products in several countries.

Chapter 5 *Results*

The results chapter describes the results of the interviews that were conducted based on the concepts from the literature.

Chapter 6 *Conclusion*

In the sixth chapter, the results are linked to the Theoretical framework (Chapter 2) and the research questions (Chapter 1). The conclusion answers the research question and sub-questions.

Chapter 7 *Discussion*

Chapter 7 critically reflects on the thesis and suggestions for further research are made.

Chapter 8 *Recommendations*

The last chapter concludes with recommendations for Radiuz and Amaze, and other interested (future) MaaS providers.

2. Theoretical framework

2.1 Influences on travel behaviour

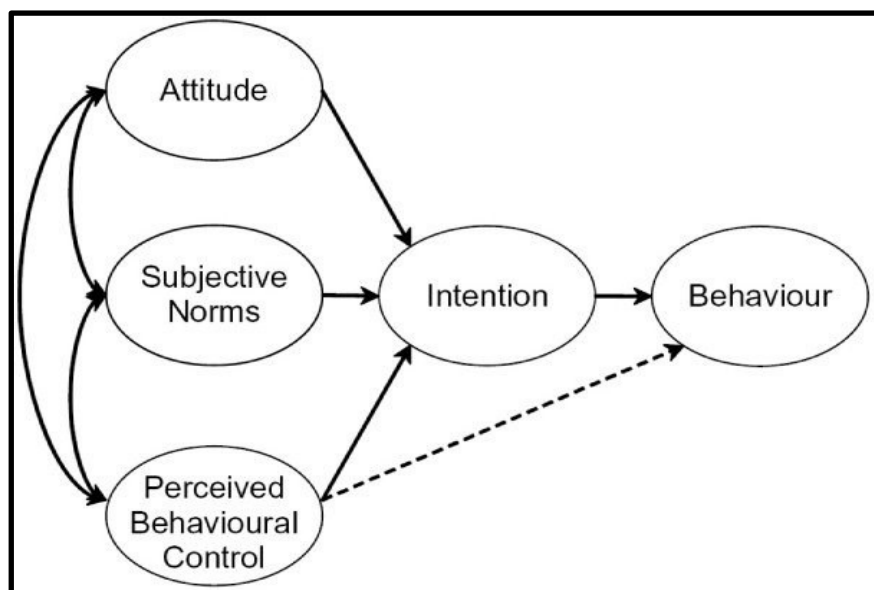
This chapter describes the theoretical framework of the research. First, the Theory of Planned Behavior (Ajzen, 1991) and the studies that have already been conducted based on this theory are discussed. After this, there will be zoomed in on the attitude and intention within the Theory of Planned Behavior. In line with the exploratory nature of this research, the literature will then indicate what exactly are the determinants of the attitude of travellers to shared mobility. These will be further explained in the subsections. In addition, shared mobility and the connection between land use and mobility will be discussed. This theoretical framework is concluded with a conceptual model that serves as preparation for answering the main and sub-questions.

2.1.1 Theory of Planned Behavior

According to Kuppam and Pendyala (2001) it can be noted in the scientific literature that travel behaviour maintains to be repeated on a daily, on a weekly and also on an annual time span (). Studies based on motivational models, such as the Theory of Planned Behavior (TPB) Ajzen (1991), suggest travel behaviour is the consequence of a consideration development (Bamberg, Ajzen & Schmidt, 2003). This travel behaviour partly consists of the habit of a journey and means that there is barely to no consideration in travel behaviour. According to Gärling and Axhausen (2003) consideration is not effective in these cases.

In his Theory of Planned Behavior by Ajzen (1991) states that the most important indicator of behaviour is intention. As a result, he indicates that intention depends on three determinants, namely "attitude" (attitude to behaviour), "subjective norms" (vision of environment), and "perceived behavioural control" (assessment of self-efficacy). A combination of these factors, as shown in Figure 1.2, leads to the intention which then results in certain behaviour.

Figure 1.2 The Theory of Planned Behavior by Ajzen, I., 1991, Organization Behavior and Human Processes, 50 (2), 179.



The Theory of Reasoned Action (TRA) is originated in the 1970s (Fishbein & Ajzen, 1974, Ajzen & Fishbein, 1977,). It had a very early impact on travel theories (Gärling, Gillholm & Gärling, 1998; Koppelman & Lyon, 1981). It has at no time surpassed various choice models yet (McFadden, 2001). The Theory of Planned Behavior (Ajzen, 1991), the successor to the TRA, is not a theory concerning choices, but instead intentions to execute behaviour are being assembled. According to the Theory of Planned Behavior, a distinction is created encompassed by people based on the antecedents of the intention to achieve certain behaviour. An inequality with various choice models is that intentions are determined too by factors besides attitudes to behaviour (Ben-Akiva et al., 1999). Ajzen (1991) states that the more positive the attitude towards behaviour, the stronger the intention of an individual to display the considered behaviour use. Together with people not entirely consider their attitude towards these two modalities, except they additionally have the complication of utilizing them. The second factor that influences intention are the subjective norms. Baron & Branscombe (2012) state that the subjective norms are the experiences of what an individual thinks other people expect of him or her. This is referred to as self-efficacy, also referred to as the "perceived behavioural control". This is about the extent to which someone thinks they can perform the behaviour (Baron & Branscombe, 2012).

2.1.2 Habitual behaviour

One of the major criticisms of the Theory of Planned Behavior by Ajzen (1991) is that it is based on rational, conscious behaviour only (Sniehotta, Pesseau & Araújo-Soares, 2014). However, the behaviour is often unconscious, also called habitual behaviour (Danner, Aarts & De Vries, 2008). Habitual behaviour is routine behaviour and is developed through repetition and (positive) reinforcement (Schwanen, Banister & Anable 2012). Habits of behaviour are activated without a person consciously thinking about them and are thus firmly anchored in a person's brain (Schwanen, Banister & Anable, 2012). Therefore, habitual behaviour is difficult to change and, if deviated from, is often replaced by new routines (Smith & Graybiel, 2013). Considering mobility, Verplanken, Aarts, and Knippenberg (1997) show that persons with a strong habit of choosing a specific mode of transport acquire less information and have less extensive choice strategies about other modes of transport than persons with a weak habit. This is in line with the research by Aarts and Dijksterhuis (2000), which shows that habitual behaviour about mobility means that the purpose of a trip (the destination) is associated with a certain travel behaviour. This means, for example, that a person associates the purpose of traveling to university with bicycle use, and that bicycle use is therefore automatically activated when the person has to go to university. According to Klöckner and Matthies (2004), in addition to the goal of travel, various stimuli influence mobility behaviour. For example, when it rains, the behaviour can be activated automatically to take the car. The strength of habitual behaviour depends on the frequency and consistency with which this behaviour has been carried out in the past (Aarts & Dijksterhuis, 2000). Participants in the study by Aarts and Dijksterhuis (2000) were asked to name a different modes of transport for a specific purpose than they usually used for that purpose. It turned out that if they were cognitively burdened, which meant that in addition to thinking about another modes of transport, they also got a second cognitive task, they had difficulty suppressing the usual travel mode. The existence of mobility behaviour as a routine, therefore, ensures that a person has more memory capacity to think about other (important) things such as what a person must do all day (Klöckner & Matthies, 2004). According to Aarts and Dijksterhuis (2000), this confirms that habitual

behaviour is an automatic reaction and is difficult to suppress under cognitive stressful circumstances.

Although habitual behaviour is difficult to suppress and change, various studies have shown that habitual behaviour can be changed during important life events, such as when people move, the family composition changes or when they change jobs (Verplanken, Aarts, Knippenberg & Moonen, 1998; Schäfer & Bamberg, 2008; Kwasnicka, Dombrowski, White & Sniehotta, 2016). At important life events, a person's social or physical environment changes, which weakens (mobility) routines (Müggenburg, Busch-Geertsema & Lanzendorf, 2015). Some people are more open to processing new information and trying new things, such as other forms of mobility, during important life events (Schäfer & Bamberg, 2008). According to Gärling and Axhausen (2003), people with (strong) habitual behaviour about a mode of transport are not susceptible to searching and processing information about alternative modes of transport. This means that if there were important changes, such as alternative modes of transport that would become available at the time, people with strong habitual behaviour might not even notice it (Gärling & Axhausen, 2003).

This is confirmed by Harms (2003), who emphasizes that routines are good for preventing cognitive overload, but that they also have negative consequences for the perception and acceptance of sustainable modes of transport. A large part of society has developed routine behaviour concerning car use, as a result of which sustainable transport alternatives will be largely ignored or will not be evaluated about their wishes and needs. Verplanken and Aarts (2011) also mention that strong habits make a person less attentive to (new) information. Not only about alternative behavioural options, but also about the context in which the behaviour takes place. Considering (the strength of) habitual behaviour and other personal and environmental factors that play a role, Schäfer and Bamberg (2008) emphasize that an important life event does not automatically lead to new (habitual) behaviour.

The role of habitual behaviour in the choice of mode of transport has been increasingly recognized in recent years, as has the mutual relation between habitual behaviour and intention (Schwanen, Banister & Anable, 2012). According to Schwanen et al. (2012), this is mainly because various studies have criticized the Theory of Planned Behavior. For example, this theory would not take into account the link that habitual behaviour makes between intention and actual behaviour (Verplanken et al., 1994, 1997; Aarts & Dijksterhuis, 2000). Various studies show that if habitual behaviour is not or hardly present, the intention to a certain behaviour is high (Triandis, 1977; Verplanken et al., 1997; Gardner, 2009). Conversely, when people use a mode of transport out of habit, the intention is low. So the more often a certain behaviour is performed, the stronger the determinant becomes "habit" and the weaker the determinant "intention" (Triandis, 1977). Danner, Aarts, and De Vries (2008) mention that the context in which behaviour is carried out must be taken into account. For example, behaviour can often be performed, but if the context (place, time, situation) in which the behaviour is performed often differs, the behaviour is still driven by intention. Likewise, if the behaviour is always performed in the same context, but the behaviour itself is not regularly performed, then the behaviour is still driven by intention rather than habit (Danner et al., 2008).

Another aspect of the relationship between intention and (habit) behaviour, and also a criticism of the Theory of Planned Behavior (Ajzen, 1991), is that if a person has the intention to change his or her behaviour, this does not always actually happen (Sniehotta, Scholz & Schwarzer,

2004). This is called the intention-behaviour gap. Thus, according to Armitage and Conner (2001) and Sheeran (2002), the TPB is good at predicting intentions for behaviour, but not good at predicting actual behaviour. According to Sheeran and Webb (2016), about half of the intentions result in the actual execution of the behaviour. According to other studies, this is even less (Armitage & Christian, 2003; McEachan, Conner, Taylor & Lawton, 2011). This can be traced back to the fact that habitual behaviour is difficult to change, and people can therefore quickly revert to the old behaviour. If the behaviour has to be changed in the long term, however, habitual behaviour can play a role in this. If the desired (new) behaviour is eventually converted into habitual behaviour, a fall back to the old behaviour is considerably smaller.

Transport behaviour in a stable context mainly consists of habitual behaviour. If you choose your car according to a fixed pattern, you will not just decide to switch to another modes of transport. A mobility option is chosen on the autopilot, and is therefore not considered consciously or rationally (Gardner, 2009; Aarts et al., 1998; Gärling & Axhausen, 2003; Verplanken et al., 1997). When a journey in a stable context has become a habit, alternative modes of transport will no longer be considered. The stronger the habit, the more effort it will take to change that behaviour. So, if you want to break through habitual behaviour, rational reasoning is not effective (Gärling & Axhausen, 2003). After all, people don't think any more about what they choose because it happens automatically. To break through automatic transport behaviour, a trigger is needed that changes the status quo somewhat, which forces people to reconsider the choice of transport. Think for example of road works, a change of work location or an increase in parking costs. These kinds of changes can serve as "windows of opportunity", which means that it is a good time to change the behaviour. After all, the habit has already been broken and other choices have to be made. A series of studies based on motivational models, for example, the Theory of Planned Behavior (Ajzen, 1991) as mentioned before, suggests that passenger behaviour is the result of a cost-weighting process (Bamberg et al., 2003; Bamberg & Schmidt, 2003). However, it appears that the repetitive nature of decisions about travel behaviour is neglected (Gardner, 2009) because habits seem to dominate transport choices, suggesting that habitual behaviour in a stable context outweighs the cost of travel.

2.1.3 Overview of studies on MaaS

Several models have been drawn up in the literature that further analyse behaviour for the Dutch context (Vlek, Steg & Jager, 2013) (Hendriksen et al., 2010). According to these models, the behaviour is primarily determined by the intrinsic motivation and intention of individuals. There are several within this motivation and intention to distinguish between determining factors. Some examples are:

- Rational considerations: such as practicability;
- Social factors: such as values and social control;
- Emotions: such as state of mind.

These factors do not have to be consciously experienced (Wendel, 2013). Once a habit has developed, it will unconsciously be maintained. This is both a challenge and an opportunity for realising behavioural change (Duhigg, 2013). That there is a chance here is evident from the fact that every year one-third of the Dutch population changes it's mobility behaviour (Centraal Planbureau, 2018). Three different strategies regarding general behavioural changes are

cited: 1. manage behaviour with changes in external factors; 2. steer towards changing a habit based on an adaptation of desired behaviour; 3. create awareness on the choices made and discuss these with individuals (Wendel, 2013). In addition, it has been found that an integrated approach leads to effectiveness (Bamberg & Rees, 2017). This implies different behavioural control resources are combined (Breukers et al., 2013). Another fact is that it has been shown that shortly after a life event such as relocation, birth of a child, or transfer to another employer people tend to change their travel behaviour. (Clark, Chatterjee & Melia, 2016).

In the field of shared bicycles, the Theory of Planned Behavior has been applied many times. For example, by Sigurdardottir, Kaplan, Møller & Teasdale (2015) using the Theory of Planned Behavior to indicate that the intention to use a sharing bicycle system is comprehend to a positive cycling experience, eagerness to accept car limitations and negative attitudes compared to cars. Kaplan, Manca, Nielsen & Prato (2015) applied the Theory of Planned Behavior and found that tourists' interest in sharing bicycles on holiday is positively influenced by 'pro-cycling' attitudes, interest in cycling technology, cycling experience and perceived cycling convenience.

Although the total number is still small, there is a growing number of studies on MaaS, see Appendix F. This list contains the most prominent articles in the field of MaaS from recent years. Most of these studies concern results from pilots in specific contexts, such as Karlsson, Sochor & Strömberg (2016) on the UbiGo pilot in Gothenburg. On the other hand, they focus more on organizational or technical difficulties in setting up MaaS, such as Kamargianni & Matyas (2017), who have published a discussion paper on business models for delivery services using MaaS.

2.2 Determinants of attitude and intention

In this part, the determinants that appear to be important from the literature study when making transport choices are discussed. These determinants are based on attitude and intention within the Theory of Planned Behavior (Ajzen, 1991). To be able to answer this question regarding attitude and intention towards shared mobility, knowledge is required about the determinants of travel behaviour (Klößner & Friedrichsmeier, 2011). Extensive research has been conducted into these determinants and their interrelations in various domains, including psychology (Stradling, 2011) and transport research (Klößner & Blöbaum, 2010). Studies into the influence of attitude on the choice of transport method show that attitudes have an indirect influence on behaviour (Klößner & Friedrichsmeier, 2011).

2.2.1. Accessibility

Accessibility of a mode of transport is essential to start using it. When using a particular mode of transport accessibility and availability are determining factors. Access to transport is defined by being accessible and available (Karlsson et al., 2016). Accessibility means that shared mobility is nearby. In the UbiGo pilot, the distance to the modes of transport proved to be decisive for use. For example, participants used shared cars if they were parked less than about 300 meters away (Karlsson et al., 2017). In the UbiGo pilot, participants also emphasized that pick-up and drop-off locations for car-sharing systems must be nearby to start using them (Sochor et al., 2015). In terms of availability, Karlsson et al. (2017) also describe how frequency plays a role in this. UbiGo participants not only choose public

transport because there are boarding places nearby but also if they can board frequently. The success of the service also depends on the degree of accessibility of the platform. In the MaaS experiments, the provision of mobility services also falls under what is called access-based consumption (Bardhi & Eckhardt, 2012). The core of this service is offering a very accessible mobility system for the user. Mobility services are made more accessible in MaaS by offering them via a single ICT platform comparable to platforms such as Netflix and Airbnb (König et al., 2017). This access-based consumption gains value because it allows "consumer freedom of life and flexible identity projects" as reported by Bardhi and Eckhardt (2012). Accessibility via an information platform based on ICT and GPS is expected to play an more and more important role in constructing travel behaviour (Gössling, 2018). Apps, in particular, will become essential in that they will provide access to real-time and tailor-made travel solutions in specific locations and through the simplicity and wide acceptance in use (Lathia et al. 2013).

2.2.2 Flexibility

Alternative modes of transport and services that increase freedom of choice and flexibility, therefore, have the potential to entice motorists to leave their cars. Freedom of choice is about having options to choose different modes of transport (for example, a bus or electric bicycle), as well as having the option for different versions of one mode of transport (for example, shared electric city car or shared family car). Flexibility is about the easy availability of those options at different times. Strömberg et al. (2018) argue that the composition of different travel services should be flexible enough to be considered an available option for travellers. If this flexibility is not available, the service will not attract users. In the MaaS solutions, such as UbiGo and Smile, it can be observed that the participants especially appreciate the high degree of freedom of choice and flexibility that is offered to the travellers. In the UbiGo pilot, participants particularly appreciated the varied fleet with different types of cars to which they had access (Sochor et al., 2016). According to Spickermann et al. (2014), great diversity in supply will increase freedom of choice and flexibility, which will increase accessibility. They then argue that, partly because of this, fewer private passenger cars will be needed in the future. People like to be able to make their own decisions, if they feel that their freedom of choice is being restricted, this can lead to resistance (Miller et al., 2007).

2.2.3 Monetary costs

The monetary effort, the costs of shared mobility versus private modes of transport, also plays an important role in the transport choice process. It can be argued that cost savings are to the benefit of an individual and thus would be an important aspect of joint consumption (Rapoport & Chammah, 1965). Mont (2004) argues that the satisfaction of shared cars is affected by cost savings, counting the initial cost of purchasing the vehicle. Lamberton & Rose (2012) consider the cost advantages of sharing the variable costs to be decisive for the use of shared mobility. Bardhi & Eckhardt (2012) emphasize that economic aspects are an important reason and even surpass other considerations as ethical ones. Moeller & Wittkowski (2010) emphasize that sharing options are usually cheaper than non-sharing products or services, and that price awareness is a fundamental determining factor for the use of shared mobility. The Willingness to Pay (WTP) is a variable that shows how much money people are willing to pay for a particular service. This WTP can differ per mobility service and user group (Ratillainen, 2017). It is therefore important to provide insight into this when offering a mobility service (Kamargianni et al., 2016). Holmberg et al. (2016) argue that different user groups have

different willingness to pay for the mobility service. An analysis of the data collected during the UbiGo pilot in Gothenburg showed that mobility services characterized by ease of use, freedom of choice, tailor-made offer and convenience add value compared to the transport solutions consisting of private modes of transport of these participants before the start of the trial. This increased the WTP of the Swedish participants for the mobility services offered (Sochor et al., 2015).

2.2.4 Effort

The choice of a particular mode of transport is determined, among other things, by the amount of time and energy that people estimate require that mode of transport. Consider, for example, the effort (namely costs and effort) required to take out an account or subscription versus the effort required to maintain your car. Creating an account should be easy so that there is a greater chance of mobility service (Ratilainen, 2017; Karlsson et al., 2016). The easier it is to use, the greater the chance that people who do not have their own vehicle will see the choice for shared mobility as a worthy alternative. Simplicity can ensure that one intuitively knows how to use a new product and there is no need to learn something new to start using a new product (Rogers, 2003).

2.2.5 Autonomy

Owning a car gives many people a great sense of freedom and autonomy: "The car allows me to go wherever I want". This perception of freedom is often overestimated. For example, the final evaluation of the UbiGo pilot showed that the need for owning a car was assessed 30% higher before the test than after the test. People then keep a car in their possession for feelings of autonomy and freedom - people want an option 'just in case' (Karlsson et al., 2016). The feeling of autonomy is indicated by motorists by the idea that one is 'in control' over public transport, for example, where people are concerned about connections and feel that they have no control over the situation (Stradling, 2007).

2.2.6 Personal advice

Information and feedback appear to be important in encouraging individuals to make desirable transportation choices (Andersson et al., 2018). Before people change their travel behaviour, they would like to be personally informed about alternative travel options specific to their situation. This suggests that people benefit from personal help when transitioning to a new way of traveling (Stopka, 2014). Personalised travel information can be particularly useful to introduce more people to new forms of transport, such as electric cars, easily and comfortably. In certain situations, it can even offer opportunities for people who normally travel by car if personal travel advice is offered.

2.2.7 Reliability

Various studies show that reliability is an essential condition for people to choose a certain mode of transport (Hagen and Bron, 2014). It is mainly the uncertainty about the reliability: is a shared mobility system as reliable as your own transport? This mainly concerns the availability of a mode of transport, as well as the quality and related safety of a mode of transport. For example, in a study on the use of shared cars, Ho et al. (2017) show that people are eager to pay more for last-minute availability so that they are sure of a mode of transport

when they need it. Haahtela and Viitamo (2017) emphasize yet another form of reliability; travellers wish to be equipped with an accurate and adequate alternative route when public transport delays occur. Reliability is interpreted differently by different people. For example, Chorus and Dellaert (2012) discovered that people who dislike risks do not easily choose travel options other than those they already use. People generally choose less quickly for the travel alternative when the quality (e.g. price, speed) is only known during or after use. So before using other modes of transport as an alternative to their car, most people want to make sure in advance that the mode of transport is of good quality and that it is available when they need it.

2.2.8 Ease

During a choice of transport, such as choosing alternative transport instead of a private car, people continuously weigh the limits of their convenience. To what extent is it still comfortable in terms of effort, both monetary and non-monetary? If these limits are exceeded, people drop out. The exact location of this boundary depends on the individual. It is known that the simplicity of a product is conducive to ease of use. Rogers (2003) even argues that simplicity is one of the core qualities that makes innovation possible. The UbiGo pilot is a good example of this. By offering all mobility services via one app, participants have gained a new insight into what convenience means to them (Sochor et al., 2016). The degree of simplicity of this service improved not only accessibility and commitment, but also the participants' confidence that any problem could be solved immediately using the platform (Sochor et al., 2015). As a result, there is a general increase in the experience of convenience. In the Smile pilot in Vienna, 55% of the participants indicated that, due to the convenience of one comprehensive mobility service, they were more likely to combine different modes of transport than before they participated in that pilot (Karlsson et al., 2017). They mainly combined public transport and cars (26%) and bicycle and public transport (26%) more often (Smile mobility, 2015). After using the app during the Smile pilot, 48% of participants described that their travel behaviour had changed afterward using the app, including subscribing to new mobility services, using faster routes, and combining different modes of transport (Smile Mobility, 2015). In short, it is plausible that people are tempted to travel multimodally employing a high degree of convenience through the integration of mobility, so that they leave their private car more often.

2.2.9 Travel time

The (perception of) travel time is an important factor when considering a particular mode of transport. Whether one mode of transport is faster than another is often subject to the perception of how fast a transport solution is that can deviate from the actual speed. For example, Van Exel and Rietveld (2009) showed that motorists in Amsterdam significantly overpredict travel time by public transport. Nevertheless, informing these travellers of the travel time there could be saved when taking public transport did not seem to assure them to convert transport modes. Other justifications were found for their existing behaviour (Tertoolen et al., 1998). This suggests that the perception of speed and travel time is often stuck in a fixed attitude pattern, which shows that rational considerations do not always play a role in a particular preference for a transport mode.

2.2.10 Sustainability

Different forms of sustainable consumption are becoming more and more important (Schuitema & De Groot, 2014). This is especially true for sustainable consumption, according to Hamari, Sjöklint & Ukkonen (2013), who identify this as an important factor of the intention to share. It is widely believed that sharing solutions have a positive impact on the environment compared to non-shared solutions, because the aggregation of resources attends to expanded intensity when an entity is used for a product. The material required for each independent product is decreased, overproduction is reduced and waste is limited (Mont, 2004). A study of Botsman & Rogers (2010) showed that car sharing users reduce emissions up to fifty percent per capita.

2.3 Shared Mobility

2.3.1 Bicycle-sharing

Bicycle-sharing systems are an increasingly prominent business model of sharing economy and have emerged as a popular mode of transportation in recent years (Chen, 2016). From a society perspective, bicycle-sharing systems meet the growing focus on sustainable development due to its convenience, lower costs, and environmental friendliness (Cohen & Kietzmann, 2014, Eckhardt & Bardhi, 2015). For this reason, many bicycle-sharing systems have been started to meet the need.

History of bicycle-sharing

When attention is paid to the history of bicycle-sharing systems, the first two generations mainly took place in Europe. In the first phase of the bicycle-sharing systems, on the one hand, the initiatives seemed extremely successful in France, and on the other, this failed in the UK. The launch of "Bycyken" in Denmark in 1995 led to the second generation of bicycle-sharing systems with distinctive bicycles, designated docking stations and a small payment to unlock the bicycles, and became very successful and widespread across Europe. The third generation of bicycle-sharing systems includes advanced bicycle reservations, pick-up, drop-off, and information tracking technologies and is available not only in Europe but also in Asia and America (Shaheen, Guzman & Zhang, 2010). The market grew explosively from 2007 onwards by 2014 more than 855 cities had introduced bicycle sharing systems (Richter, 2015). In 2017, there were approximately 1,250 shared bicycle systems worldwide with a total of over 10 million bicycles (Schönberg, Dyskin & Markewitz, 2018). China appears to be the world leader in the bicycle sharing market with more than 70 brands of shared bicycles, 16 million bicycles, and more than 130 million users (Apurva, 2017). According to Roland Berger, the global bicycle-sharing market is expected to grow by 20% and grow to a total value of 3.6 billion euros by 2020 (Berger, 2016).

Types of shared bicycles

Shared bicycles come in various forms, such as normal bicycles, electric bicycles, and (electric) cargo bicycles. Shared bicycles can be implemented in two ways, namely station-based and free-floating (Chen, Wang, Sun, Waygood & Yang, 2018). Station-based means that in a city there are one or more bicycle racks where the shared bicycles can be collected and then returned in a rack of your choice (Shaheen, Chan, Bansal & Cohen, 2015). The

use can be one-way or round-trip. The second form of implementation of shared bicycles is free-floating. There are no bicycle racks, but the user can pick up and leave a shared bicycle at any location within a geographically defined area (Chen et al., 2018). According to Pal and Zhang (2017), the advantage of a free-floating system is that much fewer start-up costs are required compared to a station-based system since no bicycle sheds or racks have to be placed. The disadvantage of both free-floating and station-based is that the bicycles can be spread disproportionately across the city or bicycle stations (Fishman, 2016). The bicycles must, therefore, be distributed evenly throughout the city, for example by bus or truck. This not only costs a lot of time and money but also reduces the environmental benefits of both systems (Fishman, 2016). However, according to Fishman (2016) and Romanillos, Zaltz Austwick, Ettema and De Kruijf (2016), advanced bicycle technology can now be mapped using advanced technology such as GPS systems, which makes it possible to respond better to the distribution of shared bicycles.

Users of shared bicycles

According to Ricci (2015) and Chen et al. (2018), showed that users of shared bicycles are mainly white, highly educated men. They have an average to above-average income, are younger than the average local population (25-45 years), and most of them also have bicycle for their private use. Research by Chen et al. (2018) also shows that shared bicycle use decreases as the travel distance increases.

A limited total of studies have examined the reasons for the use of bicycle-sharing systems. For example, Castillo-Manzano & Sánchez-Braza (2013) argued that people who use shared bicycle systems are convinced that it is more practical to take a short trip within the city with a shared bicycle and thereby reduce traffic congestion and environmental pollution. Likewise, Bachand-Marleau et al. (2012) have suggested that the convenience of the sharing system and the request to avoid vandalism of private bicycles are the main reasons for using such a system. Subsequently, Faghih-Imani, Eluru, El-Geneidy, Rabbat & Haq (2014) argue that people are willing to use shared bicycles because it does not require the responsibility and costs of owning a private bicycle to be borne by themselves. take. Nonetheless, studies on the history of the usage of bicycle-sharing systems lasts unique and dispersed. Partly, this is since most bicycle-sharing systems are though in the initial development phase (Te Pai, 2015).

2.3.2 Carsharing

Types of carsharing

Four different forms of the use of carsharing are distinguished (Becker, Ciari & Axhausen, 2017; Firnkorn & Shaheen, 2016; Wilhelms, Merfeld & Henkel, 2017):

- *Round-trip car sharing*. In round-trip car sharing, users begin and end their journey at the same location (Le Vine, Lee-Gosselin, Sivakumar & Polak, 2014). Shared cars have a fixed location and users pay based on the distance or time driven.
- *Peer-to-peer car sharing*. Peer-to-peer car sharing is a private form of car rental, in which car owners rent their private car (temporarily) to others (Ballús-Armet, Shaheen, Clonts & Weinzimmer, 2014). Here too, payment is often based on the distance or time driven.
- *Point-to-point free-floating car sharing*. With point-to-point free-floating car sharing, users can leave a shared car in any parking space within a certain zone (Kortum,

Schönduwe, Stolte & Bock, 2016). Shared cars do not have a fixed parking space in this system, and therefore do not have to be returned to the same place where the user started the journey. In contrast to round-trip car sharing, this form is also known as one-way car sharing.

- *Point-to-point station-based car sharing*. As with free-floating car-sharing, with point-to-point station-based car-sharing, the shared car does not have to be returned to the same place where the user started the journey (Le Vine, Zolfaghari & Polak, 2014). This is also a form of one-way car sharing. The difference between free-floating and station-based, however, is that with station-based car sharing, the car may not be left anywhere in the public space, but in a few designated places within a certain zone (Le Vine et al., 2014).

There are differences in why and for what a certain type of shared car (free-floating and station-based) is used. For example, research in Switzerland shows that station-based shared cars are often used by self-employed people who are flexible and use a car when necessary (Becker et al., 2017). According to Ciari, Bock, and Balmer (2014), station-based shared cars are mainly used for short activities, because the longer an activity lasts, the more expensive the rental period of the shared car. Free-floating shared cars are mainly used by young, high-income men whose residential location does not optimally connect to public transport, while this does not have a significant effect on the use of station-based car sharing. According to Becker et al. (2017), this is in line with other studies, namely that free-floating shared cars fill the mobility gap for people for whom public transport is not easily accessible. Le Vine et al. (2014) therefore conclude that round-trip car sharing has a more positive impact on the transport system as it complements public transport, while free-floating car sharing is more an alternative to public transport. Free-floating shared cars are also often used when it saves time compared to other transport options, while station-based round-trip shared cars are used when a car is needed (Becker et al., 2017). In addition, several studies show that station-based car sharing has a greater effect on reducing car ownership and mileage per car than free-floating car sharing (Martin & Shaheen, 2016; Steer Davies Gleave, 2018).

Users of shared cars

As of shared bicycles, various studies show that users of shared cars are mainly white, highly educated men (Carteni, Cascetta & De Luca, 2016; Clark & Curl, 2016; Kopp, Gerike & Axhausen, 2015). They have an average age between 25 and 45 and have an average to above-average income. According to Wielinski, Trépanier, and Morency (2017) and Carteni et al. (2016), users of shared cars mainly focus their mobility on public transport. The study by Carteni et al. (2016) shows that the positive effects of the use of shared cars on the environment are one of the reasons for its use. However, a stated preference study by De Luca and Di Pace (2015) shows that users of shared cars care more about personal benefits than about social or environmental benefits. In addition, they are more motivated by convenience than affordability. However, travel costs still play the most important role when switching from a private car to a shared car (De Luca & Di Pace, 2015). Schaefer's (2013) study revealed both convenience and the environment as well as motives for the use of shared cars, as well as personal factors such as a person's lifestyle.

Research by Clark and Curl (2016) shows that non-white British people between the ages of 16 and 29, who live in a private sector rental home, with a diploma and a job, and who do not travel to work by car or public transport have the best access to a 'station' where shared cars

or shared bicycles are offered. However, no evidence was found that better access to shared mobility results in a change in car ownership. According to Clark and Curl (2016), this does point to the clustering of shared mobility stations at central locations, which means that some groups of people have better access than other groups of people. Also, research by Kim (2015) shows that in New York, the demand for shared cars in low-income neighbourhoods is no different than that of neighbourhoods where there are already shared cars (mostly neighbourhoods with medium to high income). However, the big difference is affordability, which is consistent with the study by Cartenì et al. (2016). This indicates that shared car initiatives could work in these neighbourhoods, provided the prices for shared cars are lower or subsidized.

2.4 Land use & mobility

2.4.1 Spatial features

Spatial features influence travel behaviour in various ways. The relationship between space and travel behaviour can best be explained using the 6 D's (Ogra & Ndebele, 2014). First *density*. Higher building densities generally lead to an increase in geographical accessibility, lower car ownership, and more use of public transport (KiM, 2016). Proximity to activity locations ensures better accessibility by bicycle and on foot. The high density also ensures that public transport can be organized more efficiently (Schwanen et al., 2004). *Diversity* (blending functions) also contributes to the proximity of activity locations. The third D stands for *design*. How the spatial environment is arranged influences the travel time it takes to get to a certain location. This is often linked to the street pattern; many crossings make it easier to get to your *destination* (Cervero & Kockelman, 1997). The accessibility of the *destination* is also important (Ewing & Cervero, 2001). This determines the trip distance and the mode of transport choice. A fifth factor is the *distance* to public transport (*distance* to transit). Bus and train use is positively related to the proximity of boarding points (Ewing & Cervero 2010). The sixth D stands for *demand management*. This affects the attractiveness of (the use of) different modes of transport. An example of this is that when there are few parking spaces in a residential area and the rates are high, people are more likely to use alternative modes of transport.

2.4.2 The transport-land use feedback cycle

Mobility is stimulated or limited by redesigning, renewing, or expanding the city (Rodrigue, 2017). For example, factors such as the density of the built environment, the mixing of facilities or of living and working, the connection to other areas, and the walkability of an area affect how people move in a district or city (Cao, Mokhtarian & Handy, 2007). Land use in the city is also about infrastructure, where the construction of infrastructure can improve the mobility and accessibility of areas (Geurs & Ritsema van Eck, 2003). Hansen (1959) defines accessibility as the ability of a person in a location to participate in a particular activity or series of activities. According to Cascetta, Cartenì, and Montanino (2013), this possibility is determined by distance and travel time, socio-economic factors such as travel costs and income, the attractiveness of activities, and the quality of various transport options. Also, infrastructure can affect modalities among themselves (Rodrigue, 2017). If the infrastructure in a neighbourhood is aimed at cyclists and pedestrians, the use of these modalities will probably increase and

the use of cars will decrease. However, infrastructure can also affect land use (Rodrigue, 2017). Infrastructure leads to the mobility of people, and where people are there is a demand for facilities. Mobility therefore directly affects land use because infrastructure is being built, and indirectly because infrastructure leads to the further development of areas such as shops near station areas and restaurants next to highways. The mutual influence of land use and mobility is accurately depicted in the Circle of Wegener (Figure 1.3). The most important elements of the circle are accessibility, land use, activities, and transport systems (Van Nes, 2017). If a place is easily accessible, there will be more demand for facilities at that location. The construction or improvement of infrastructure leads to better accessibility (Wegener, 1995). More or better facilities will change the pattern of people's activities around these facilities, leading to more or different mobility and (further) improvement of the transport system (Van Nes, 2017; Rodrigue, 2017). This again results in better accessibility where the circle starts again.

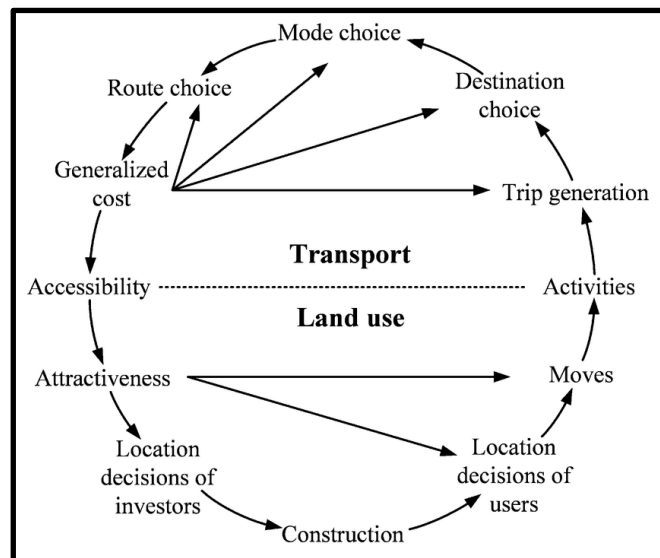


Figure 1.3: The transport-land use feedback cycle (adapted from Wegener, 1995).

2.4.3 An alternative for the car

In addition to the relationship between land use and transport, the choice of a specific mode of transport also influences the travel behaviour of people (Levinson & Krizek, 2018). Nowadays, a frequently heard statement is that car ownership among young people is declining and young people attach less value to it (Van Acker & Witlox, 2010). However, there is no agreement in various studies on this. Car use among young people has indeed declined in recent years and train travel has increased, but when young people end up in a new phase of their lives - from around 24 years old - car use increases considerably again.

It seems that situational characteristics such as living in a city, a lower number of young people working and economic circumstances more influence car ownership than age itself (KiM, 2018). First of all, accessibility to the urban centre is important (Krygsman, 2004; Rodrigue, 2017). The better the accessibility of areas on the outskirts of the city to the urban centre, the less distance that residents in these areas will travel by car. Density also plays a role here: if areas have a higher density, the distance to work, housing, and recreation will become smaller (Stevenson, 2016; De Vos, Derudder, Van Acker & Witlox, 2012; Knuiman et al., 2014). This has a positive effect on the distance traveled by car and results in higher use of modes of transport other than the car and lower car ownership. Mixing land use is when living, working, and different forms of facilities can be found in and around an area. Provided these land uses are well connected, this will mainly encourage walking (Knuiman et al., 2014). As mentioned in the previous paragraph, infrastructure also has an effect on the type of transport and to what extent people use a mode of transport. The better roads connect, the less time you have to travel, but the more likely the car will be used. If footpaths connect better, non-motorized

transport will increase (Knuiman et al., 2014). In addition, the multimodal layout of streets, which means that a street is aimed at different forms of transport, will stimulate forms of transport other than the car. When setting up a street, physical traffic measures can also be taken, such as speed bumps and obstacles, such as poles or planters, to reduce the speed. Together with a good and safe walking and cycling infrastructure and sufficient bicycle parking spaces, this leads to less car use and more use of active forms of transport such as walking and cycling (Knuiman et al., 2014). Finally, the quality and accessibility of public transport influence the reduction of car use (Ogra & Ndebele, 2014).

2.4.4 Public transport usage

It should be noted that studies such as Vedagiri and Arasan (2009) have shown that there is a bigger chance of changing a modality for holiday travel than for commuting. Even travellers who actively consider choosing different travel suggestions for their trip do not delay their choice because of the risk and the fact that the valuation of the travel alternative only becomes apparent after using it assess (Chorus and Dellaert, 2012). Supported by Bovy and Stern (1990), slowness is described as “factors (...) that promote the maintenance of the status quo and prevent behavioural changes” (p. 110) and “certain threshold values that must be exceeded before routine behaviour changes” (p. 32). That drivers in Amsterdam significantly overvalue the travel time by public transport, has been shown by Van Exel and Rietveld (2009). Advising these travellers about the travel time could be saved by using public transport cannot persuade them to change the mode of transport (Tertoolen, Van Kreveld & Verstraten, 1998). In any case, transport decisions are not solely rational because emotions (De Vos & Witlox, 2017) and affective and symbolic factors (Steg, 2005) play a role in travel behaviour too, in some cases even more than instrumental factors (Anable & Gatersleben, 2005).

Collins & Chambers (2005) show that attitude has a positive influence on the use of public transport. Multiple authors confirm the finding that attitude positively influences the intention to travel to work or campus by public transport (Ambak, Kasvar, Daniel, Prasetijo, & Ghani, 2016; Zailani, Iranmanesh, Masron, & Chan, 2016). Ajzen (1991) states that the stronger the intention to display a certain behaviour, the more likely the behaviour will occur. An example of this are the various articles in the scientific literature that confirm that if one has the intention to adopt an environmentally friendly attitude, the chance of environmentally friendly behaviour will be higher (Swaim, Maloni, Napshin & Henley 2014; Mancha & Yoder, 2015). In addition, several authors argue that the use of public transport is influenced by the intention to travel sustainably (Ambak et al., 2016; Donald, Cooper & Conchie, 2014).

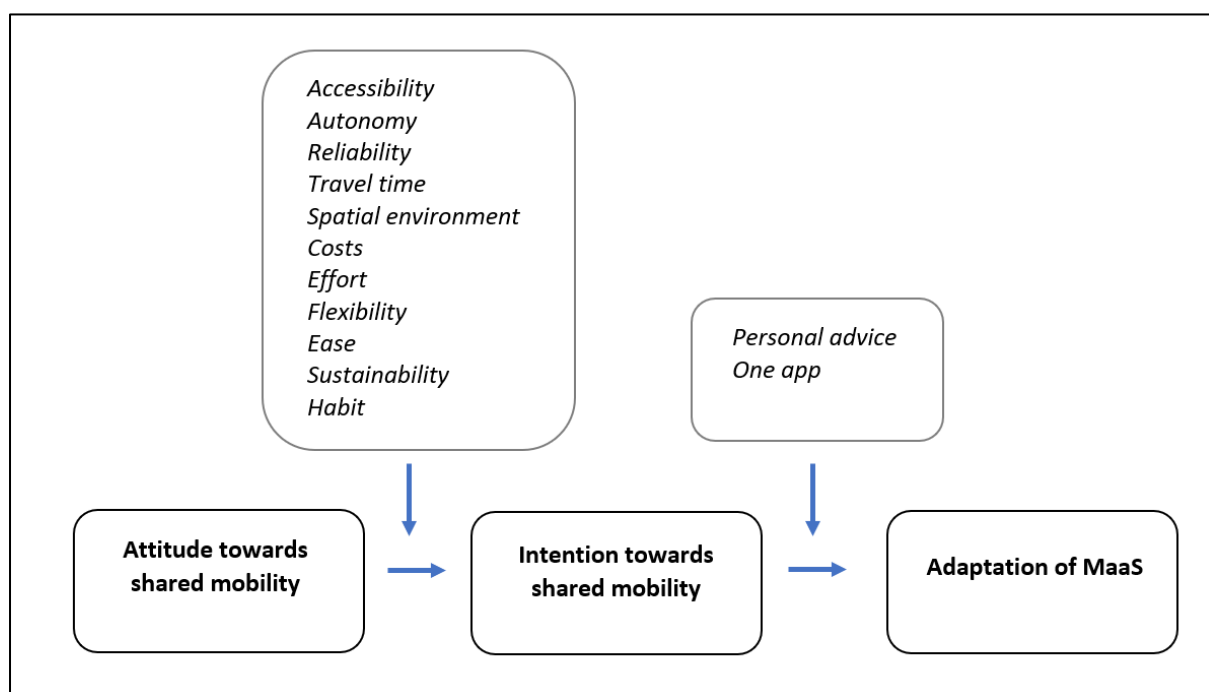
2.5 Conceptual Model

This thesis based on the main research question - *“To what extent do the attitude and the intention of both employees and employers in the Zuidas towards shared mobility contribute to adapt MaaS and how can its use be stimulated?”* - has an exploratory character. For this reason qualitative research will be conducted. As has become apparent from the theoretical framework, no research has so far been conducted into the attitude and intention with regard to shared mobility among employees and employers in the Zuidas. In this thesis, attitude is defined as the preferences of employees and employers when using shared mobility. That there has been a relationship between attitude and intention has been shown by Farahbod et

al. (2013) for example. Considered is that when a person has a positive attitude towards a particular circumstance, likely it will influence the intention (Lee, 2009; Shah, Aziz, Jaffari & Waris, 2012).

To investigate this relationship, a conceptual model is presented. The conceptual model (Figure 1.4) consists of three phases that influence each other from left to right. The first phase consists of the attitude towards shared mobility. This research assumes that the theory of choice of transport can be applied to attitudes towards shared mobility. This attitude is based on a number of factors, also called determinants, namely Accessibility, Autonomy, Reliability, Travel time, Spatial environment, Costs, Effort, Flexibility, Ease, Sustainability, and Habit. The valuation of these factors will influence the intention of shared mobility; referring to the individual's positive or negative sense of the specific behaviour, which is the most important antecedent of the Theory of Planned Behavior that has been empirically shown to promote intention (Kusumawati, Halim & Said, 2015). For this reason, it was consciously decided to conduct specific research into the attitude of employees and employers. Subsequently, a prediction is made on the basis of intention towards the adaptation of MaaS based on Azjen (2012, pp. 439) "intention is the immediate antecedent of behaviour". The combined intention offers an insight into the adaptation to use MaaS, but is not yet sufficient. MaaS is offered as more than just facilitating shared mobility. One of the distinguishing factors is the merging of mobility service via a single platform (König et al., 2017) such as an app that makes it a very accessible mobility system for the user. Offering a tailor-made travel solution, as suggested by Lathia et al. (2013) and personal travel advice is also suggested as one of the reasons that could increase the adaptation of MaaS according to Atkins (2015).

Figure 1.4 Conceptual Model



3. Methodology

3.1 Research strategy

A research method is an approach to arrive at answers and conclusions to the research question (Vennix, 2011). A method is by definition not defined per subject or research question; it is the researcher himself who decides which research methods best suit the research to be conducted. The first option chosen was a document analysis. Because the researcher uses the work of others, the researcher must critically analyse the sources and only extract the information that is relevant to the research (Vennix, 2011). Because this study pays attention to the indicators towards the attitude of employees and employers towards shared mobility and their intention to use shared mobility with the ultimate goal, it can be valuable to look at policy documents, pilot programs, and evaluations of collaborations. In addition to scientific literature, use has also been made of officially issued policy documents used in the introduction, such as those from the municipality of Amsterdam, Planbureau van Leefomgeving (PBL) and the Kennisinstituut voor Mobiliteitsbeleid (KiM).

To answer the main question, exploratory research is carried out based on literature study. Exploratory research aims to gain a better picture of the research problem and area and to gain different ideas about the subject (Angelelli & Baer, 2016). Explorative research is characterized by qualitative research methods, with semi-structured interviews chosen within this research. The interviews are conducted with employees of companies located in Zuidas. Interviews with employees were chosen because they are seen as potential customers of the MaaS provider Amaze. The choice of employees is based on the assumption that when the needs can be met, employers will be interested in purchasing subscriptions. This makes it easy to connect large numbers of customers, resulting in a relatively greater chance of a profitable business case.

3.2 Research philosophy & research approach

It is important when conducting research to understand the research philosophy. It is therefore about the nature of knowledge development and how you think about the development of knowledge. Consciously or unconsciously, this influences the way you conduct your research. Saunders, Lewis and Thornhill (2012) address the three predominant views on research design: positivism, interpretivism, and realism. The positions are not mutually exclusive and are about the way in which knowledge is generated in an acceptable manner. Positivism is based on an objective analyst who works with patterns, and which are collected in a value-free way. Interpretivism, on the other hand, is of the opinion that the social context is too complicated to grasp in laws. Generalization is therefore not the starting point of this position. Central is the need to find out what "the details of the situation are in order to learn to understand reality or perhaps an underlying reality that determines the situation", says Remenyi (1998). The third point of view is a realism based on the idea that there is a reality independent of human thoughts and ideas. Realism, like interpretivism, recognizes that people themselves are not objects to be studied in the way of the exact sciences. The objective nature of realism with regard to macro aspects of society is an important distinction with interpretivism and at the same time an agreement with positivism. In the context of attitude and intention with regard to shared mobility among employees and employers in the Zuidas and the

influence this has on the adaptation of MaaS, an interpretive approach leads to the knowledge that is being sought. Generalizability is not essential because the circumstances are unique. Understanding certain transport choices made by people requires an analysis of the social context. Gaining insight into the employers' mobility policy requires an analysis of the subjective reality of policymakers. In this way, it is possible to compare theoretical views on shared mobility with practice. The research, therefore, has an interpretive character.

When choosing a research approach, roughly three methods can be distinguished. The way in which the research proceeds and is structured has to do with the method you use. Saunders et al (2012) distinguish deduction, induction, and abduction as methods of approaching research. In deduction, theory development is central and laws form the basis for an explanation. This is the most commonly used approach in the exact sciences. An inductive approach assumes that the theory follows the data and not the other way around as with deduction. The result of the data analysis is thus the development of a theory. The last research method is abduction which in fact combines induction and abduction. Abduction is based on a 'surprising fact' and then looks for a theory that provides an explanation for this. This research uses an inductive approach. There are several arguments for this choice, but the most important is that an inductive method is in line with interpretive research philosophy and thus looks for details of the situation in order to understand reality in this way. In analysing the attitude and intention towards shared mobility, understanding the context is essential to understand certain motives. The collection of qualitative data is also a hallmark of induction and therefore appropriate for this study. The flexible structure of the research also makes it possible to emphasize other aspects in the course of the research. Finally, the little importance that is attached to generalization is an argument for choosing an inductive approach. The research, therefore, has a strong qualitative character due to the interpretive philosophy and the inductive approach. Qualitative research analyses views of "participants" and the relationships between them, using various techniques of data collection and analysis (Saunders et al, 2012, p. 163). This results in a conceptual model that tries to describe reality. In addition, the data collection is often "non-standardized" and the choice of research objects is based on "non-probability" (Creswell, 2007, p. 36). There is therefore a lot of room during the research to comment on interesting findings.

3.3 Research methods

This thesis makes use of inductive research, since a qualitative approach is involved, using only a small sample (Saunders, Lewis & Thornhill, 2015). This study is an empirical study, which is in line with deduction; testing a theory or model. Saunders et al. (2015) have described four different steps of how an inductive investigation proceeds. The first step is to form a theory based on a literature study. This study carried out a literature study in which the Theory of Planned Behavior (Ajzen, 1991) is combined with variables that play a role in the choice of transport mode of employees and the attitude and the resulting intention towards shared mobility. This is then merged into a conceptual model. The second step involves the researcher forming hypotheses or borrowing research questions from the theory. This study describes determinants towards choice of transport mode, attitude and intention towards shared mobility. hypotheses were presented related to personal characteristics, the indicators for transport choice, and their influence on the various factors. The concepts are then made ready for use or the variables are derived from the theory. In this research, an overview was

made based on the theory of the variables that influence the adaptation of MaaS, such as the correlation of attitude with intention. The final step is for the researcher to use a research tool to measure the variables; in this thesis it concerns an interview. In this way it emerges, among other things, which variables have the most influence on the attitude, subjective norms, perceived behavioural control of employees on the Zuidas. This qualitative approach to research belongs to an inductive study (Saunders et al., 2015).

By applying in-depth interviews, the experience of both employees and employers in the Zuidas towards shared mobility is discussed. It is important to reveal the different perspectives of the respondents (Boeije et al., 2009). The interviews provide insight into the practice of the transport choice of the employee and their experiences with shared mobility. This information can hardly be retrieved, if at all, by other methods (Hay, 2010). Having individual conversations also results in a more recent impression of the attitude and intention toward shared mobility. The disadvantage of having individual conversations is that these conversations can always be coloured by personal views (Rall, Kabisch & Hansen, 2015).

3.4 Data collection

To get as broad a picture as possible of the attitude and intention towards shared mobility in the Zuidas, employees, employers, and experts were interviewed. The employees interviewed are employees in the broadest sense of the word, varying from a facility function to a manager position. Of the group of employers, HR managers, Corporate Citizenship Strategy, Corporate Social Responsibility staff members, or other stakeholders in the mobility policy were interviewed. The employees and employers interviewed are all directly employed by a company on the Zuidas. The size of these companies varies from a few, tens to several hundreds at the location itself. However, a number of companies have thousands of employees in the Netherlands and in some cases tens of thousands worldwide. The experts interviewed are involved in the development of mobility in the city of Amsterdam as the region.

A total of thirteen respondents were interviewed during eleven interviews, because around that number of respondents no innovative results emerged from the data, whereby saturation in the data collection was achieved (Guest, Bunce, & Johnson, 2006). A respondent table is shown in Appendix A. The names and positions of the respondents were anonymized in this study, so that the privacy of the respondents is guaranteed. The interviews were conducted in connection with the advice to stay at home because of the situation surrounding COVID-19 by telephone or utilizing the video calling service provided by Microsoft Teams. Respondents were asked permission to make a sound recording before the interview. The answers are based on the circumstances before the COVID-19 outbreak.

Respondents were found to personal business, and from colleagues in the field and on email addresses that can be found on the Green Business Club Zuidas website. The respondents were approached regardless of whether they use shared mobility. In addition, employers and experts have been approached to share their vision on what MaaS has to offer. This is given the assumption that the respondents who interpret the employer and the expert are aware of what MaaS offers. The length of the interviews ranged from 32 minutes to 1 hour and 27 minutes with an average of 53 minutes.

3.5 Data analysis

After the interviews are conducted, the data analysis of the interviews will take place, which is based on the Grounded Theory of Glaser and Strauss (1967). This means that after transcribing the interviews, the transcripts were coded through open coding, axial coding, and selective coding (Scheepers, Tobi & Boeije, 2016). This was done using the Atlas.ti software. Before performing a thematic analysis, the first steps involve fragmenting and encoding the transcripts. This is relatively simple in the Atlas.ti software; there are many options for carrying out these steps and this can be done in various places in the software (Frieze, 2019). The schematic representation of the coding process can be found in Figure 1.5. First, coding is open, coding the themes that were considered important in the interviews. This is important to provide structure and overview. Subsequently, coding is done axially, with the open codes being further specified. This is done by comparing the codes and linking or merging associated codes, creating main and sub-themes. Finally, coding is selective, comparing both open and axial codes. This allows connections to be discovered between different concepts or codes. After open, axial, and selective coding, a code tree can be composed. Based on the coding and the final code tree, the interviews were interpreted and the results obtained were discussed.

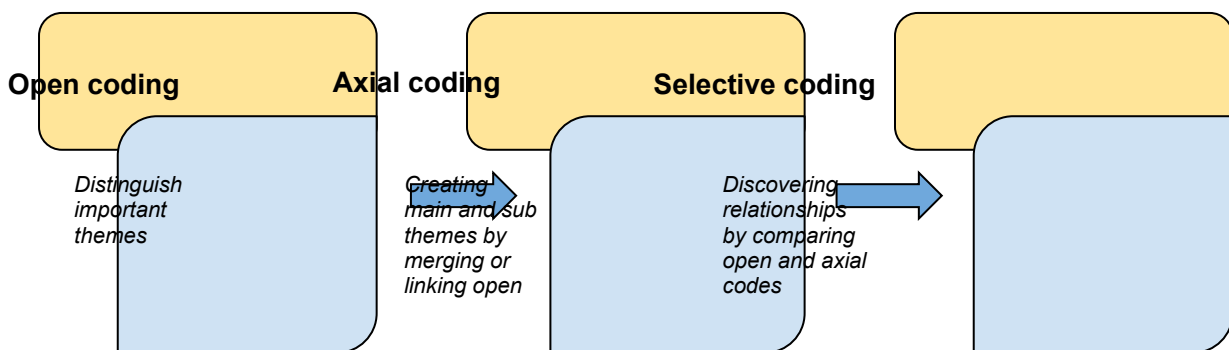


Figure 1.5 Schematic representation of the coding process.

3.6 Validity and reliability of the research

This thesis takes into account the factors validity and reliability. In scientific research, data collection must be performed reliably and validly. The reliability of an research is about limiting random errors to a minimum. This prevents the outcome of an research from being a fluke. The validity of an investigation focuses on the prevention of systematic errors. This ensures that the observations from a study cover reality (Baarda & De Goede, 2006).

Different types of validity can be distinguished. One species, the concept validity, deals with the comparison of instruments that aim to measure the same (Baarda & De Goede, 2006, p. 192). The statements and questions during the interviews come from the literature used, to which the conclusion of this study also refers back. The second type of validity is internal validity. This thesis meets the conditions of the internal validity is guaranteed in this study by determining the homogeneity of the studied target group. Based on these values, it was checked whether the variables were measured as intended. The data resulting from this scale has not been used in the analysis of this study to ensure internal validity. If the results of a study can be generalized, they are also referred to as externally valid. With this third kind of

validity, the outcomes must be the same at a different place, time, or under different circumstances (Baarda & De Goede, 2006, pp. 133).

There are many different views among researchers about what makes qualitative research valid (Creswell & Miller, 2000; Golafshani, 2003; Leung, 2015). Yet, according to Creswell and Miller (2000) and Golafshani (2003), there is an increasing shared view that if qualitative studies are to be valid, they must be primarily "credible." Credibility is about describing the research as well as the results. It is therefore important that the choices made within the study are described as precisely as possible, and that the results correspond with the respondents' experiences. To meet these criteria, a methodological chapter is written as detailed as possible within this research and all interviews are documented as well as possible employing audio equipment and subsequently transcribed. This is so that no information is lost and the interpretation of the researcher corresponds as much as possible with the information given by the respondents rather than with reality (Mortelmans, 2013). Also, according to Mortelmans (2013), self-reflection can increase credibility. In addition to providing the best possible description of the research process and the findings, this research will therefore also include a reflection on the research process.

According to Gratton, Jones, and Robinson (2011), reliability in qualitative research is characterized by the consistency of the way data is collected. Therefore, the same procedure is followed repeatedly for each interview. In this way, every respondent receives the same information about the survey. Besides, each interview is conducted by the same researcher, to prevent a research error and more or less the same questions have been asked of employees, employers and experts as found in the Appendix. As the moderator, the task of the researcher is to let the respondents speak freely and not to direct them in a specific answer direction. For example, after each topic discussed, the researcher provides a summary of the respondent's answers, to avoid misconceptions. In addition, before the interview, the researcher emphasizes that no good or best answers are possible. This is to prevent possible subject bias, as this may make a respondent less compelled to give socially desirable answers.

4. Context

In this chapter, the issues regarding mobility and MaaS mentioned in chapter 1 will be explained in more detail. The first section focuses on the current mobility challenges in the Netherlands, the Randstad, Amsterdam, and the Zuidas specifically. In the second section attention will be paid to the already completed MaaS pilots and products, called Smile, UbiGo, Whim, and SLIM Nijmegen. These pilots contribute to the background of this research and will, therefore, be explained in more detail.

4.1 Mobility challenges

Before zooming in on the Zuidas area, first, it is useful to discuss all relevant topics in the field of mobility. This overview helps to gain insight into current issues at a national (Netherlands), regional (Randstad), urban (Amsterdam), and local (Zuidas) level.

4.1.1 The Netherlands

Due to the improving economy and increasing mobility of the Dutch, a strong increase in traffic on the road is expected (Mobility Alliance, 2019). “The traffic in our country is getting busier. The road network, cycle paths, and railway lines are slowly clogging up. To prevent the Netherlands from getting stuck in the coming years, mobility must be organized differently.” These are concrete words from the Mobility Alliance, consisting of 25 parties, including various transport organizations such as the ANWB, NS, Bovag, and the RAI Association in the Delta Plan 2030. On 12 June 2019, the Delta Plan was presented to the Minister and State Secretary for Infrastructure & Water Management. The Mobility Alliance presents a package of proposals to prevent the Netherlands from clogging up.

4.1.2 Randstad

Before zooming in on the Zuidas, attention will first be paid to the general situation about mobility in the Randstad. Both here and in more and more urban areas in the Netherlands, the current flow of travellers, despite the extensive road network and the fine-grained rail infrastructure, can only be processed with difficulty. The prediction is that these areas will only become busier in the coming years due to an increase in residents and visitors (Manders & Kool, 2015). In the more peripheral regions, the opposite is the case: the population is declining and with it the profitability of current public transport (Manders & Kool, 2015). Different mobility problems play a role in urban areas and peripheral areas, but in both areas, the current trends seem to only become stronger, which requires new mobility solutions. Various initiatives to stimulate the use of public transport have already been reviewed. However, public transport is less flexible than a car and it is less easy to incorporate into people's daily routine according to Berveling, Bakker, Harms & Van der Werff (2009). Also, people generally prefer the quality and comfort of their car to that of public transport (Berveling et al., 2009).

4.1.3 Amsterdam

Before discussing the Zuidas, it is first of all important to discuss mobility in the municipality of Amsterdam. The Amsterdam region has grown significantly in recent years (Gemeente

Amsterdam, 2018). This growth is expected to continue unabated in the coming years, with a projected growth of approximately 150,000 additional homes in the city between now and 2040 and the same growth outside the city in the Amsterdam Metropolitan Area (Gemeente Amsterdam, 2018). Currently, mobility in Amsterdam on municipal roads inside and outside built-up areas accounts for 9% of CO₂ emissions. If traffic outside municipal roads is also included, such as Amsterdam commuters who work outside the city, CO₂ emissions will increase. According to the European Union, these trips account for about 25% of CO₂ emissions in Amsterdam (Gemeente Amsterdam, 2019). Between 2025 and 2030, all traffic in Amsterdam must be emission-free (Gemeente Amsterdam, n.d.).

Passenger cars (private use, taxis, and delivery vans and light freight vehicles) generate 88% of CO₂ emissions from all traffic in Amsterdam and are responsible for 95% of the number of kilometres driven in the city (Gemeente Amsterdam, 2019). On the other hand, the positive development is that car ownership in the municipality of Amsterdam is declining, and that 70% of people's journeys to, from and within Amsterdam are made in a sustainable manner (public transport, cycling or walking). In 2017, for example, 36% of Amsterdam residents traveled by bicycle, 24% by car, 23% on foot, and 16% by public transport (Gemeente Amsterdam, 2017). Even though the average car ownership among residents of Amsterdam is decreasing, the number of cars and the number of trips by car in the city continues to increase annually, partly due to the increase in the number of inhabitants of the municipality of Amsterdam (Gemeente Amsterdam, 2019).

To achieve the objective of emission-free traffic, efforts are being made to further develop (fast) charging infrastructure and subsidy schemes for electric transport (Gemeente Amsterdam, 2015). In addition, environmental zones have been established for trucks, vans, coaches, taxis, and e-scooters. The 'Schoner Parkeren' scheme has also been implemented, which means that a parking permit is no longer issued for old and polluting passenger cars (Gemeente Amsterdam, 2015). Further measures to reduce car ownership and therefore CO₂ emissions are the introduction of low parking standards, especially for new-build locations and high parking rates throughout the municipality, especially the centre.

4.1.4 Zuidas

The Zuidas, as one of the most important international office locations in the Netherlands, has also grown rapidly in recent years. This growth has a downside in the form of increasing pressure on the infrastructure, and with unchanged travel behaviour of residents, commuters, and visitors also a sharp increase in traffic congestion. To accommodate the growing passenger flows in the long term, the preparatory work for the Zuidasdok project (Rijkswaterstaat, 2016) was started in 2018, in which the A10 Zuid will be widened and partly tunnelled and Station Zuid expanded considerably. This station now processes more than 80,000 travelers per day, but this is expected to be 240,000 by 2030 (Hermanides, 2018). From 2020, this work will lead to noticeable traffic nuisance on the road and the train and metro tracks. In the 2017 coalition agreement (Rijksoverheid, 2017), as discussed in the Introduction, the government expressed the wish to entice motorists to elect different modes of transportation. On the other hand, the long duration of the Zuidasdok project (approximately ten years) offers opportunities to realize the necessary behavioural change (Gemeente Amsterdam, 2018).

Several large construction projects will also be taking place in the Zuidas area, which is divided into different separate neighbourhoods as found in Figure 1.6, in the coming years. Construction will cause a nuisance and will mainly have consequences for the accessibility and liveability of the surrounding area. At the same time, Zuidas is undergoing a transformation from a business to a more residential area: the Gershwin and Mahler districts now have around 3,500 residents. For them, liveability and vibrancy are topical subjects. In the coming years, Ravel will be developed into a neighbourhood with housing, student housing, offices, shops, and educational and sports facilities. The area between the VU, Amsterdam UMC, and the A10, or the “Kenniskwartier”, will in the future accommodate a mixed program of living, working, education, hospital care, and parking facilities. (Gemeente Amsterdam, 2020).

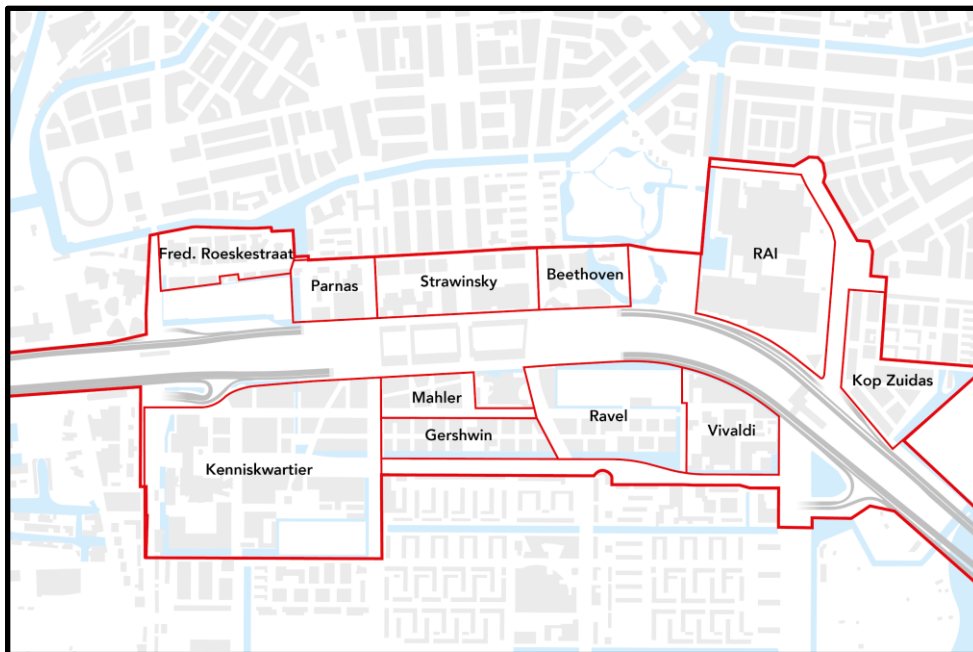


Figure 1.6 The distribution of the different neighbourhoods in the Zuidas district (Source: Zuidas, 2016).

The last four decades have seen major changes in the settlement pattern of office-based companies. Easily accessible locations on city fringes and highways are rapidly developing as an office area. Originally, the first office buildings in the Netherlands arose in the city centres. Today, Dutch city centres have a much less prominent position as office areas within the office market. This is in contrast to the situation in the office markets of other large cities, such as London and Paris (Korteweg, 1998). Modern and easily accessible office locations have been created in the Netherlands, of which the Amsterdam Zuidas is an example. Although the first developments into an office area on the site that is now called the Zuidas occurred earlier, the World Trade Center (WTC), which is located in Strawinsky, was only developed in its current position in 1985. For a long time, the area served as a reception area for offices leaving the central city (Korteweg, 1998). The arrival of the World Trade Center in 1985 is seen as the start of the large-scale office development of the Zuidas. The WTC had a floor area of 110 thousand square meters, 72 thousand square meters of which were office space and numerous facilities, and was later expanded by 40 thousand square meters (Korteweg, 1998). It can be said that the development of the Zuidas, as the main office location in Amsterdam, has gained momentum since the arrival of the ABN Amro in 1999 (Zuidas, 2019a) The arrival

of the ABN Amro head office has served as a flywheel for the current development of the Zuidas as a popular location for (international) office-based companies. Today, the Zuidas is home to approximately 800 companies, of which 19.3% financial sector, 14% business sector, 12% ICT sector, 7.4% energy sector and 4.8% life sciences sector. 42.5% of the companies is in the group of miscellaneous (Zuidas, 2019b). In addition, the Vrije Universiteit, with approximately 25,000 students and 3,000 staff members, can be found in Amsterdam UMC and the RAI conference centre on the Zuidas. Until 2030, more than 1 million m² of homes, offices, and facilities are going to be developed in the area (Zuidas, 2019b).

4.2 Pilots

Although much attention is paid to MaaS, only a few pilots have been carried out so far. Since the development of MaaS in the Zuidas is also a pilot, so as a defined period, it is useful to learn from previous MaaS pilots. What results are there? What is satisfaction about, but also what points of attention are there? This includes the Smile pilot in Vienna, UbiGo in Gothenburg, Whim in Helsinki, and SL!M in Nijmegen. These pilots contribute to the planning relevance of this research and will, therefore, be explained in more detail. Particularly useful information is available about the first two pilots, UbiGo and Smile. This has been applied in chapter 2, and will also be highlighted in the results of chapter 5.

4.2.1 Smile

The one-year MaaS pilot Smile in Vienna was part of a multi-year research program. A mobility platform has been set up within the research project in which all functions such as travel information, booking, payment, and travel are made accessible. More than 1000 users participated and were able to pay for the trip according to use. About 200 participants completed a survey afterward (Karlsson et al., 2017) and found that 75% of participants are satisfied with Smile. What also stood out from the results is the increase in intermodality; public transport was more often used in combination with a bicycle or car. The reason for this is that the Smile app indicated that this was a faster travel option. Compared to the Viennese population, it was noticeable that Smile users show a relatively high bicycle and public transport use, it included a relatively low percentage of car users and a growth in the use of car- and bicycle-sharing systems (Karlsson et al., 2017).

4.2.2 UbiGo

The UbiGo pilot took place from November 2013 to April 2014 in Gothenburg, Sweden. 195 people in 83 households took part in the pilot (Karlsson et al., 2016). Planning, booking, and payment all went through one app. UbiGo brought together existing transport options and providers that were offered as a package to participants. They were able to subscribe to the package that best suited their travel behaviour (Karlsson et al., 2016). After the pilot, participants reported a large decrease (48%) in their private car use. Participants also indicated that they planned their trip more often in advance than before using UbiGo. The attitude had also changed; participants had become less positive about the private car and more positive about the shared bicycle, shared car, and public transport. A study by Sochor et al. (2014) provides an overview of the various travel motives. Besides "curiosity", "convenience", "cost", and "the environment", the "opportunity to test life without a private car" was also mentioned as motivation.

4.2.3 Whim

The largest pilot to date has been held in Helsinki, on which MaaS Global (one of the initiators of MaaS) and Ramboll published the report “Whimimpact: Insights from World's First Mobility as a Service Solution” on March 28, 2019. The report is based on data from 70,000 registered users based on Whim's first operational year in the capital of Finland (Ramboll, 2019). Whim is recognized as the world's first broadly deployed MaaS provider, bringing together different modes of transport in one monthly subscription. The main findings of the study argue that public transport is the foundation of MaaS, and besides;

- MaaS users are convinced of the benefits of multimodality and use both taxis and bicycles to deal with the last-mile issue;
- MaaS travellers connect public transport with taxis three times more frequently in comparison to other residents of Helsinki;
- Customers consume a broad selection of mobility services and are changing to more sustainable travel patterns. Conceivably this could have a significant influence on car dependence and eventually urban congestion;
- 73% of MaaS users complete their journeys by public transport while an average resident makes 48% of their travels by public transport;
- Of all bicycle rides by MaaS users 42% are combined with public transport (Ramboll, 2019).

4.2.4 SLIM Nijmegen

Besides the “Mobiele stad pilot” in the neighbourhood Paleiskwartier in Den Bosch (Mobiele Stad, n.d.) another MaaS pilot carried out in the Netherlands so far is SLIM Nijmegen. This initiative from the municipality of Nijmegen, the Breng Kenniscentrum, Bereikbaar Heijendaal, and various educational institutions focuses on the Heijendaal campus in the south of the city of Nijmegen (GoAbout, 2017). With 45,000 students, 17,000 employees, and around 5,000 visitors a day, this district is one of the busiest places in the Province of Gelderland, which has led to great pressure on the accessibility of that region (Crommelin & Slavenburg, 2018). There have been several interventions; one of these is the development of the MaaS concept in the district. This MaaS provider, which uses the already existing GoAbout app, combines various modalities such as shared bicycles, shared cars, and regular public transport. The GoAbout App currently unlocks the following mobility services:

- SLIM Campusbike;
- SLIM Campuscar;
- Arriva travel product (train on the route Venlo - Nijmegen Heijendaal);
- Breng travel product (buses Nijmegen) (GoAbout, n.d.).

The modalities are placed at different locations at the station and in Heijendaal. One of the goals is to realize various SLIM Hubs in Nijmegen where different modalities come together, such as public transport, Breng Flex (taxi service), shared cars, and shared bicycles (GoAbout, 2017).

Based on the data that emerged from the various MaaS pilots, it can be stated that shared mobility plays a significant role in the valuation of MaaS. Based on the knowledge from the Theoretical Framework, combined with the background information acquired in this Context chapter, research has been conducted into the attitude, intention and adaptation of MaaS. The results of the interviews can be read in the next chapter.

5. Results

After conducting eleven interviews, information has been gathered about the attitude and intention concerning shared mobility among employees and employers in the Zuidas. The findings from the interviews are presented thematically in this chapter utilizing the following five main themes: (1) choice of transport mode, (2) attitude towards shared mobility, (3) intention towards shared mobility, (4) the added value of MaaS, and (5) the synthesis of the results with the Theory of Planned Behavior. The first three main themes demonstrate which factors are most important in the choice to opt for shared mobility, which conditions shared mobility must meet to make its use more attractive and what the opportunities are for MaaS. These main themes will be further explained in this chapter based on various sub-themes. The abbreviation EPLR stands for "employer", EPLE is formed by "employee" and EXP means "expert". The submitted examples referred to in the results are available in the Appendix.

5.1 Choice of transport mode

The findings are presented thematically in this paragraph utilizing the following three themes: (1) mobility policies, (2) general transport mode choice, and (3) the use of shared mobility amongst the respondents. This section serves as an introduction to section 5.2 on attitude and 5.3 on intention towards shared mobility, to provide background information on respondents' travel preferences.

5.1.1 Mobility policies

In general, it can be said that a distinction is made between two groups of employees; those who are eligible for a lease car and those who are not. Except for a lease car, there are two other options; reimbursing travel expenses utilizing a kilometre allowance or providing the public transport card and offering a mobility budget for which the employee can reimburse the transport options: "So you either basically receive just a set cash amount every month, or you do a lease car" (EPLR#4). These groups can be further divided as follows:

- **Lease cars:**

Several employers conclude that they are still traditionally recognised in the field of lease cars. According to the majority of respondents, employees regard a lease car as a secondary employment condition. Parking rights also plays a role in the choice of a lease car. Employees are only allocated these when they opt for a lease car, while parking on the Zuidas is generally perceived as expensive. In some cases, this makes it relatively attractive from a financial point of view to choose for a lease car.

Another point of attention that is brought up is the fact that employees receive a public transport card from some employers in addition to their lease car. This is considered disproportionate by an employer, as people without a lease car are only reimbursed for their travel on working days. In addition, lease cars can also be used privately on weekends. This results in a high attractiveness: "And that gives you're an incentive to take a car because then in a weekend your costs are also kind of like covered" and "So it's really interesting that it's so attractive to take lease car" (EPLR#4).

Incidentally, almost all employers indicate that lease cars can be shared among employees and that this happens regularly. As the following employers describe: "If someone without a car has to go to an appointment, for example outside the city, they can often take a lease car from a colleague and then drive that part" (EPLR#3). This is endorsed by most employees, such as: "In addition to people who have a lease car, I also include myself, if someone needs my car, he can always use it. So in a way, it is just available to the rest" (EPLE#5).

- ***Kilometric allowance***

Another option is the travel allowance per kilometre for commuting. For most employees this is nineteen cents per kilometre, one of the employers (EPLR#3) confirms that this is eleven cents per kilometre. The reason is to motivate motorists to travel by public transport, because this is fully reimbursed: "We already have implicated a lower rate to also make a more conscious choice for employees. This kilometric allowance by car is lower in order to motivate employees to choose a different form of transport. On the other hand, for example, public transport is fully reimbursed" (EPLR#3). A similar form for commuting is the submission of a public transport certificate so that the net costs incurred are reimbursed or the facilitation of the journey with a business public transport card such as the NS Business Card.

One of the employers mentions that it is difficult to reimburse the combination of car and public transport, while it is practical for certain employees to first drive the car to a station and then take the train there. A double arrangement should be made for this, where there are still some questions regarding the registration.

- ***Mobility allowance***

A third common way of reimbursement is a fixed amount of travel expenses through a mobility allowance. Depending on the company, this is called mobility allowance, mobility budget, or flexible budget. With a fixed amount per month, the advantage is that employees can decide for themselves what they want to do: "If you would walk to work, you still get that fixed amount" (EPLE#4). The big difference with normal travel allowance is that the budget is fixed, which means that it is not possible to reimburse other travel expenses. If employees do not use mobility, the remaining amount is for themselves:

"People with a flexible budget can actually kind of decide themselves what they want to do with their budget. So for example, I had a month that I needed to travel to a client in Arnhem. So then I put a subscription on my NS business card and used my budget for that. But, for example, if you don't have to travel for a month, you get the money on your bank account" (EPLR#4).

One of the employers mentions that the mobility allowance is particularly popular among employees from Amsterdam and the surrounding area. At the moment it is a simple solution for employers and just like a lease car, the budget of the mobility allowance grows with the employee's job level. In principle, this budget can be spent on any mobility service of their choice, however, according to one of the respondents, there is no formal policy about which types of mobility employees can use. Concerning shared mobility, the OV-bicycle is sometimes used from this budget, but what is also possible is not clear to all employees: "So I have no idea how they would handle shared mobility. I think that that would probably be a type of situation where you just take the cash pile and you use it for shared mobility" (EPLE#4). Another form of the mobility budget is that it is seen as a replacement for your private car

costs. Incidentally, one of the employees feels guilty when the person in possession of a mobility allowance uses a car of a colleague or is traveling along: "So a way to stimulate the use of each other's cars that would really help because there are still have kind of like this gap where people feel ashamed of joining" (EPLR#4). Finally, one of the employers mentions that the amount of the mobility allowance is adjusted to the number of days that people work because since the employee does not have to go to the office every day, the employee can also use less.

5.1.2 General transport mode choice

Many insights emerged about the general transport choice of employees on the Zuidas. This concerns the factors that play a role in the choice of transport, without involving shared mobility. Which modes of transport do individuals now use? When a basis for this is known, something can also be said about the need for a particular type of transport within the spectrum of shared mobility.

First, some respondents indicated that their transport choice is based on a combination of several factors, of which convenience, distance, and home-situation were most often mentioned. One of the respondents indicated that efficiency was important, but that this does not always mean speed, but also the possibility to be able to do something else in the meantime, such as working on the train. The same employee indicated that he also understood efficiency in terms of a trade-off between time and money: "So it's always a bit of a time-money ratio" (EPLE#3). For another respondent, efficiency also plays a role, but as an interplay between the agreements that are made that day and the weather. Although it is generally difficult to formulate an unambiguous answer: "Sometimes you take the tram into the city and the other time you take a bicycle into the city. There is actually no logic to me. I think there is no logic" (EPLE#5). Incidentally, the weather conditions were mentioned by several respondents as the basis for their choice of transport. "It's all about me, is it raining or not raining, is it dry? Then I go by bicycle. Does it rain? Then I just go by bus or possibly if it suits me I go by car" (EPLE#1).

When attention is being paid to the general valuation of modes of transport, it can be concluded that public transport is well appreciated. The choice for the train is preferred because it is seen as efficient since the respondent makes a list during the train journey for the day and an inventory of what to start with. Also, public transport is seen as reliable, thanks to the good metro connections to work on the Zuidas. One of the respondents said: "There's a metro every six minutes right outside my house and my bicycle is obviously just right outside. So if I want to go somewhere, I don't need to check. I don't need to see what's available. I just go. So that is important to me in one sense" (EPLE#4).

This is consistent with Karlsson et al. (2017) who concluded from the UbiGo pilot that public transport was chosen not only because the boarding places are close but also the fact that they can board frequently. In addition, this employee doesn't have a car because there is no need to while the quality and accessibility of public transport are sufficient which is in line with Ogra & Ndebele (2014). The same respondent indicated that occasionally the tram is used and often Uber to locations that are difficult to reach by public transport. A number of respondents who lived in Amsterdam themselves indicated that they use the bicycle for their transportation to and from the office because of the short travel time.

Regarding the use of the car, one employer (EPLR#3) indicated that some employees must first bring their children to school and then go to work. If they did not do this by car, they would lose a lot of time. With regard to travel time, it emerged that a trip by car is much better to plan since people know when the traffic jams are. Another argument for using the car is that more senior people like to use that time to call people. In some situations, it is sensitive information that people prefer not to share. In addition, having a car at your doorstep is experienced as pleasant because you do not have to worry about it. One of the respondents (EPLR#5) indicated that they alternate between car, public transport, and bicycle (a speed pedelec) and always uses all three during the week: "The car really isn't always faster. It is very simple: by car, the travel time varies between 35 minutes and 45 minutes. By train, if there are no disruptions, my door to door travel time is approximately 55 minutes and by bicycle, my door to door time is approximately one hour and five minutes" (EPLR#5).

The question of the transport choice considerations was also put to the interviewed experts. It emerged from this that you cannot treat every Zuidas employee the same way, but that there are big differences between the needs of the business traveller. It is not similar interesting for everyone to leave the car and enter public transport. On average, it is estimated that there is a target group on the Zuidas that is much more difficult to pull out of the car than perhaps elsewhere. Involving employees in a collaborative approach is considered a prerequisite for a long-term change.

Regarding one of the employees the idea of working at a large company and easily receiving a lease car should change: "That is simply no longer sustainable, certainly not in such an area as the Zuidas. So shared mobility just becomes part of the solution there" (EPLR#2).

5.1.3 Use of shared mobility

The data obtained from both employees who have used shared mobility and employees who have not. The same applies to the interviewed employers; some offered shared mobility, but others did not. The use and attitude in general towards the shared car shared bicycle, and shared e-scooter is set out below.

○ Shared car

That there are two electric shared cars at their office that can only be borrowed for business purposes was mentioned by one of the employers. They may only be borrowed during office hours and may not be taken home. Registration is done through the reservation system, which is also used for meeting rooms. The cars are used several times a week on average. Another employer indicated to use a car rental company when this is necessary.

Two respondents of the employees indicated that they had used a shared car at some point. One respondent was a Car2Go that was used a number of times during the year. The reason for using the shared car was that when you had to carry large bags and belongings, it was easier to take the shared car than the metro. The other respondent indicated that Greenwheels is offered by the employer and has so far used it twice so far for specific trips. The reason for use was for an appointment in a place where you can not get well with public transport or it takes a long time with public transport. Greenwheels is experienced as handy if you have to go somewhere else quickly after the appointment.

- Shared bicycles

Several employers interviewed indicate that shared bicycles are offered from the office. These are office property and can be borrowed for both business trips to clients and private purposes. These are used regularly, even several times a day. The demand for shared bicycles arose from the employees so that they could easily travel to destinations in the centre instead of public transport because the employees preferred to jump on the bicycle. It was then proposed to physically have some bicycles at the office that can be borrowed. They can be used for a message as well as when someone needs it for business.

All respondents of the interviewed employees sometimes used the OV-bicycle. For some, this was the only form of shared mobility that was used. As with the following respondent “Only OV bicycle actually. Probably maybe a couple of times a year. Typically, if I just go to another city by train, then I need to rent a OV-bicycle. But not often” (EPLE#4). The OV-bicycle is used for both business and private journeys, on average once a month. Another respondent describes “I’m a really big fan of the OV-bicycle. I take that really like everywhere. I think it’s super handy” (EPLR#4).

- Shared e-scooter, shared taxi and shared electric kick scooter

None of the employees used the shared e-scooter, nor was it offered by the employers. Arguments for this are that the distances that one does with the e-scooter can also be driven by bicycle and that e-scooters must be placed on the main road instead of bicycle path.. The interviews also revealed that respondents abroad had sometimes used an electric kick scooter for recreational use. Two respondents were familiar with the shared taxi; one had previously used a shared taxi system that no longer exists¹, to reduce the costs of a taxi ride. The other respondent had occasionally used ViaVan, a shared taxi provider in the Amsterdam region.

¹ Abel, a former shared taxi service in Amsterdam, based on: <https://www.parool.nl/nieuws/taxidienst-abel-stopt-in-amsterdam~ba0003dd/?referer=https%3A%2F%2Fwww.google.com%2F>

5.2 Attitude

This section further discusses the factors that play a role in the attitude of employees and employers in the Zuidas to shared mobility. Shared mobility is experienced in both a positive and negative way. This result is supported by the determinants that contribute to a particular transport choice. These factors are discussed in the following two sub-themes in this section: (1) the main factors for choosing shared mobility, and (2) the main factors for not choosing shared mobility.

5.2.1 Main factors for choosing shared mobility

Based on the determinants discussed in the Theoretical Framework, a number have been proposed as having a positive influence on the choice for shared mobility.

Accessibility

Access to transport is achieved by being accessible and available (Karlsson et al., 2016). People are generally positive about the availability of shared mobility. One of the respondents indicated that they saw more and more electric Smarts, Greenwheels, and Felyx e-scooters driving. "So you see that capacity increase, which means that more people will also use it and that it will also become more accessible" (EPLR#3). Another employer also states that the quantity is now in order "because nobody ever complains there was no Car2Go available today" (EPLR#6). The amount of people who can lend their car to their colleagues is also large. "If a colleague of mine needs a car on the weekend and I don't need it, I can just give it to her on Friday and go home by train. Then I will get it back on Monday. It appears from the shared car providers that Greenwheels is the most attractive because it is the most widely available. In addition, it is generally stated that availability is of great importance to get into the car directly to, for example, go to the family when something happens. With regard to the availability of shared bicycles, respondents are positive about the OV-bicycle, which is in most cases available at a train station. Access is also experienced as problem-free: "You walk in and almost always you can take a bicycle. So I think that is actually well organized" (EPLE#5). Besides, the Zuid station is within walking distance: "That is a ten-minute walk from our office, so it is always nearby" (EPLE#3), making it easy to borrow a bicycle here and then, for example, to go into the city. In addition, the shared bicycles in the building where one of the respondents works are available so they can be used by all people in the building and are therefore always close by.

Reliability

Reliability as a factor in the choice for shared mobility is perceived as important, for example when traveling to customers. This is consistent with Hagen and Bron (2014) who argue that reliability is an essential condition for people to choose a certain mode of transport. In addition, one of the respondents mentioned "You don't want to have a car where you get stuck along the road" (EPLE#5). Greenwheels as a provider of shared cars is considered reliable: "Clean car, you can always get to any place you need to be" (EPLE#3). One of the reasons for the respondents' confidence in shared mobility stems from recognition. "I think Greenwheels also has such an image, they also work with NS. So if you know all that a little bit, you trust that" (EPLE#2). The same applies to the OV bicycle: "You see the OV bicycle you recognize them.

It's branding kind of helps you to know it won't be stolen. You know, if anything happens it's covered" (EPLE#2). According to the respondent, the awareness of the bicycle means that there is a smaller chance that the bicycle will be stolen. For several respondents, the question on which their trust in the provider is based was difficult to answer, but the experience is therefore discussed after using the service several times. Finally, positive reviews were mentioned, and the choice of friends, which increased confidence in the sharing mobility provider.

Flexibility

One of the factors that plays a role in the choice for shared mobility is flexibility. Strömberg et al. (2018) argue that the composition of different travel services should be flexible enough to really be considered an available option for travellers. One of the respondents mentioned that flexibility is an advantage when choosing a shared bicycle because in this way it is flexible to take the bicycle when you have to go to different locations in the city. In addition, the freedom of choice for the number of respondents is increasing due to the presence of shared mobility which is in line with Spickermann et al. (2014); great diversity in supply will increase freedom of choice and flexibility.

Spatial environment

The spatial environment in the Zuidas is generally considered to be sufficiently geared towards shared mobility. "I think that is in the Zuidas. I don't see such a problem in that. But I can imagine in the best way, the traffic situation is not always optimally organized for cyclists and things like that" (EPLE#5). Another interviewed employee indicates that everything on the Zuidas is so convenient. According to one of the employers, space for shared mobility, such as parking shared bicycles and shared cars, is available around the building. The same respondent mentions "There are really no physical barriers to facilitating those things" (EPLR#3).

Cost

When considering the costs of shared mobility and whether they positively influence the choice for this, it appears that shared mobility was in a scarce case cheaper than the alternative. An example of this is the choice of a shared taxi to save the costs of a regular taxi. This was also the case for the choice of a shared car "And I actually looked into these kinds of shared cars because it was a lot cheaper than renting a car" (EPLE#4). Also, some employees indicated that they could declare their costs for shared mobility so that they are not an obstacle and cannot be seen during use. One of the employers (EPLR#3) who provides shared mobility indicates that currently given the incidental use, the costs are not an issue.

Sustainability

One of the points that both employees and employers raise as an argument when choosing shared mobility is sustainability considerations. In addition to general issues such as the hectic pace of the Zuidas and the rising parking costs, a company is also struggling with CO2 emissions, according to a number of employers. Sustainability and CO2 reduction are therefore arguments that motivate the employer to opt for shared mobility. This is in line with Eckhardt & Bardhi (2015) who describe that bicycle-sharing systems meet the growing focus on sustainable development due to its environmental friendliness. Another employer indicates that young people want to behave more sustainably. So that due to the pressure of the young generation, the company must also comply with this. In addition, it is indicated that companies

participate in the “Anders Reizen Coalitie”, which also focuses on sustainable travel. One of the employers also announced that they have developed an app that stimulates sustainable travel in which users see how they travel and how many emissions are related to this. The company pays great attention to this. Employees confirm this sense of trying to make companies more responsible for sustainable initiatives. The limited use of a car also plays a role in the choice for shared mobility from a sustainability perspective, as the following respondent endorses “I think that a lot of cars end up just sitting around and it would be nice if there were fewer cars made and fewer cars in existence and used when needed” (EPLE#4).

5.2.3 Main factors for not choosing shared mobility

A number of the interviewed employees reported that they rarely or never use shared mobility. Arguments for this are ignorance - the existence of locations to pick up on shared cars is unknown - a residential location near Amsterdam and the general appreciation of public transport in Amsterdam that is so good. Having your own modes of transport is also a reason not to use shared mobility. As one of the respondents stated: “I am 37 and have never been in a situation where it is useful” (EPLE#1).

The employers have experimented with a number of shared mobility. The results were that in the past an employer used something similar to Greenwheels, but that the capacity in the private parking space is so great that a lease car from a colleague is often parked during the day and available for other colleagues. In this way, this issue is tackled internally as much as possible. Another employer where they had experimented with shared cars came to the conclusion that employees still came to the office in their car because, for example, they had to bring the children to school, and otherwise they would lose a lot of time.

After an introduction about not using shared mobility among the respondent, the main factors that play a role in the choice not to opt for shared mobility, which emerged from the interviews, now follow.

Flexibility

With regard to flexibility, the interviews with employers show that for some, shared mobility is not flexible enough for how the company works. One of the reasons mentioned is: “They are all different parties for something slightly different” (EPLR#3). According to the same employer, this makes the use of shared mobility not so accessible, since companies prefer to have everything together in terms of costs and functionalities. This is in accordance with Strömberg et al. (2018) that argue that if this flexibility of choosing different travel services is not satisfactory, the service will not attract users. Currently, shared mobility is spread in the market, so that you as a company soon have the idea of missing something when you choose one or the other. The employer concludes from this that it is not yet of added value: “We are also working on a more flexible mobility policy so that someone can choose what they need at the moment” (EPLR#3). This also raises the issue of working parents who have to pick up the children from childcare one day and not the next: “That may also influence whether or not you want to be stuck in traffic” (EPLR#3). According to the employer, there was not yet such flexibility, but efforts are being made to implement this so that people can also make a shared mobility choice. One of the employees indicates that it seems quite difficult to realize flexibility given the implementation of the mobility budget: “A flexible mobility budget in which one can

be deployed on one day of public transport, come the next day by bicycle, the third day with rain by car or with a shared car, that is so difficult" (EPLE#2).

Autonomy

Another factor that plays a role in the choice not to opt for shared mobility is the issue of the feeling of autonomy. One of the employees mentioned that shared mobility does not yet give the feeling of freedom: "I think that is still too limited" (EPLE#2). A few respondents put forward the limitation of the autonomy of the OV-bicycle: "The OV-bicycle is a very nice mode of transport, but it is very annoying that you have to return it at the station where you picked it up" (EPLE#3) and: "It does not yet fully meet the need. And that is also with OV bicycle, you can not hand it in at another station. You can, but then you pay another ten or so" (EPLE#2).

Accessibility

Considering the accessibility of shared mobility, the interview with one of the employers shows that it is easier to walk to your own lease car in the garage than to walk to a Greenwheels car. For some employees, it becomes too much to walk to that kind of strategic point. The same has been noted by a respondent who says: "Greenwheels is still quite a walk for us. It is located in a residential area on the other side of the water, so you will be walking for ten minutes" (EPLE#3).

When attention is paid to the availability of shared mobility, one of the employers indicates that they are overly dependent on what is offered. Certainly, outside Amsterdam this is a point of attention, for example when employees are sent to the customer at a random location outside of the city, it cannot be assumed that they will take the train, given that they may be on the bicycle for another half hour. The same employer had an internal investigation carried out into the employees' need for shared mobility and one of the results that prevented people from choosing the shared car was the non-availability of the car: "Like whenever you want" (EPLR#4). Incidentally, a large part of the respondents indicates that they are able to borrow a car from colleagues or friends when necessary. In this way, no use is made of the car-sharing providers, but instead, they are mutually exchanged.

Effort

In response to the previous, exchanging cars among colleagues, another employer also mentioned. Namely: "I think it is easier for people to grab your colleague's car than to book one with Sixt or with a shared car. You just walk to a colleague and ask for the car key. That isn't a problem at all" (EPLR#3). It, therefore, takes less effort to ask a colleague than to rent a shared car yourself.

Considering the commitment that a customer must show to use Greenwheels, for example, the respondent indicates that he should pay extra attention to this in advance. If there is an important appointment, you should book such a car one or two days in advance. It is seen as a bigger step than traveling by public transport so that less use is made of it: "Using a Greenwheels car has a little more effort. So that's why I don't use that very often" (EPLE#3).

Cost

Costs are of considerable importance in the choice not to opt for shared mobility, as appears from the conducted interviews. One of the employees said that these costs play a major role, especially within the city. Then the choice is: pay nothing for your own bicycle and pay for

shared mobility. That choice is then simply made quickly. In addition to the costs, reimbursements also count, according to the employee.

The costs are one of the most important barriers with regard to the shared car. In general, Greenwheels was considered relatively expensive, according to the following quotes: "I have thought about Greenwheels, but I think it is very expensive" (EPLE#2) and "But the hassle of doing that Greenwheels and it was also relatively best expensive actually to get a Greenwheels for a weekend. Yes, it is not worth it. So then I'll just go with public transport." (EPLE#3). This disadvantage, the timer that ticks down, is seen as a waste of money. This is in line with the Willingness to Pay (WTP) which can differ per mobility service and user group (Ratilainen, 2017).

Shared mobility is reimbursed for a number of employers, but not for some. When asked whether this is paid by the employer, a few employees replied: "Not by my employer at the moment" (EPLE#5) and: "Things like Car2Go and stuff don't really mean it should be really needed" (EPLE#3). Another employee said: "We have also looked in the past to perhaps take out something of a subscription with it. Only, we just have very few business trips actually" (EPLE#1). It follows from this that for some organizations the costs play a role in their choice not to opt for shared mobility because in these cases a subscription is not profitable.

One of the respondents indicates that when starting a new job at the Zuidas, not taking a lease car but to opt for the shared car was seriously considered. Ultimately, the lease car was chosen because the costs for shared cars were not interesting enough in comparison. So the costs, regardless of whether they are reimbursed, play a significant role "You just want that the costs are clearly stated" (EPLE#5). Following De Luca & De Pace (2015) travel costs still play the most important role when switching from a private car to a shared car.

Subsequently, one of the interviewed employers states that people consider for themselves a cost consideration of improvement: "Of course you can say everything in an idealistic way I do it for the environment. But money is also money for people" (EPLR#1), which once again emphasizes that costs play a major role in the choice not to opt for shared mobility. This is also according to De Luca and Di Pace (2015) who show that users of shared cars care more about personal benefits than about social or environmental benefits.

Travel time

Another factor that various respondents cite as an argument for not opting for shared mobility is travel time. This applies, in particular, to leave the shared e-scooter on, as the distances that you can do with a e-scooter are usually done by bicycle yourself: "So I don't use that" (EPLE#3). One of the employees who sometimes uses the shared car said that it is never faster to take a shared car for commuting. The bicycle is preferred because this is always the fastest option. This is one reason why shared mobility is disadvantageous. The time that a shared car was used, this was to bring larger items: "So not to get from A to B faster." (EPLE#2). In addition, one of the employers indicates that travel time plays a role in the choice not to opt for shared mobility because they work with customers, so they must always be on time everywhere.

Habit

Another aspect of the options for not opting for shared mobility is habitual behaviour. One of the employers describes the transition from an individualistic society to a shared society as follows: "I think it is mainly about getting used to the new behaviour. One has to actively decide to switch from an individualistic society to a shared society" (EPLR#3). This also includes leaving your own modes of transport and opting for shared mobility. But people keep a car in their possession for feelings of autonomy and freedom (Karlsson et al., 2016). The employees generally responded that the way of traveling has become so standard that people don't often think about adjusting it like this respondent: "Frankly, you don't get stuck in your habit anyway" (EPLR#3). This is supported by Chorus and Dellaert (2012) who discovered that people who dislike risks do not easily choose travel options other than those they already use. Another employee mentioned that the person sometimes takes the OV-bicycle, even if it may cost an extra half an hour, but that many people will not do this: "So that really depends on your habits, I guess as well" (EPLR#4).

Reliability

When using shared mobility, it is not always clear what it costs. This is supported by Chorus and Dellaert (2012) who discovered that when the price of the travel alternatives is only known during or after use, people generally choose less quickly for that option. This is argued by one of the employees as the following quote shows: "Some of those shared bicycle things still have a kind of complex price structure, where the price decreases the longer you use it" (EPLR#3). And then it is of course difficult to compare that with other providers or with public transport, as some respondents indicated. Another employee reports that it is very difficult to get a clear idea of this. This is similar to Kamargianni et al. (2016) who are stating that it is important to provide insight into the costs when offering a mobility service.

Spatial environment

When considering the spatial environment, it can be said that this plays a role in the choice not to opt for shared mobility. Employers have shown that the Zuidas is so packed that there is no room for shared bicycles and shared e-scooters. One of the employers states: "So space is a really, really big problem" (EPLR#4). According to Knuiman et al. (2014) a good and safe walking and cycling infrastructure and sufficient bicycle parking spaces, this leads to less car use and more use of active forms of transport such as walking and cycling. Another employer mentions the great distance from the parking space to the office, which some employees experience as a barrier for a shared car. The same issue emerges from the employees, such as the distance to a Greenwheels. The employee who has ever used Car2Go indicates that the lack of public parking has a limiting effect because it is not clear where you can park the shared car.

Ease

The employee who has ever used Greenwheels indicates that this is done through work so that it is a bit of a hassle to set up properly. If it is not used as often, it is necessary to look at what the code is again. In addition, the alternatives are generally good enough, according to the following respondent: "If I take the metro, I will be at my location about the same time that I have to take such a e-scooter - it is a lot less *hassle*" (EPLR#3). This shows that the need for a new mode of transport is not immediately present because the convenience of alternatives is greater.

5.3 Intention

This section further discusses the factors that play a role in the intention of employees and employers in the Zuidas towards shared mobility. The interest to use shared mobility is different among employees, mainly because of current limitations of shared mobility and the fact that public transport and their own bicycle are sufficient enough. The factors that apply to employees partly correspond to those of the employers, but not to others either. Apparently these factors only affect employees or employers on the other hand. In general, the interviewed employers have a positive intention towards shared mobility. The pursuit of fewer cars and thus lower parking costs, as well as sustainability objectives, play an important role. However, the limited range of shared mobility, the random locations of customers, and issues regarding the mobility budget mean that shared mobility is still not much implemented. The factors which are involved in the intention towards shared mobility is discussed in the following two sub-themes in this section: (1) the intention among employees to use shared mobility, and (2) the intention among employers to facilitate shared mobility.

5.3.1 Intention among employees

As highlighted in the first paragraph of this chapter, there are a number of factors that apply to the intention to make use of shared mobility among employees at the Zuidas. In general, the intention is present among the respondents, witness the following quotes, for example: "Yes, I'm open to it when I am in the situation that it is useful" (EPLE#1) and "I strongly believe in these types of mobility principles, so as far as I am concerned it may happen more often" (EPLE#5). However, several conditions and wishes influence the intention. The various factors are shown below.

Autonomy

For autonomy, the respondents indicate that a station-based system which means that there are one or more bicycle racks where the shared bicycles can be collected and then placed back in a rack of your choice (Shaheen, Chan, Bansal & Cohen, 2015), such as Hello Bike, or free-floating could increase the chance of using shared mobility, given the increase in freedom. In that case, there must be enough points in the area to be able to lose the modes of transport. Free-floating shared cars are also seen as potential, but with national coverage: "You would really like to have the same system as Car2Go in the city, so you can just put it anywhere, but throughout the country" (EPLE#2). Another respondent says that this could actually change the transport choice, "If there is a mode of transport that is free-floating or from hub to hub, it could already influence my travel behaviour" (EPLE#3).

Accessibility

One of the employees states that the interest in shared mobility is certainly present: "So I would definitely say I think it would be good if there were more shared mobility options" (EPLE#4). The same respondent mentions that the person would like to travel to Germany without needing to take the train. So there would be interest in a shared car to use for a longer period and where you can cross the border. Concerning mobility providers, the fact that an Amber shared car makes it affordable to drive from hub to hub leads to an interest in this transport option. However, another employee indicates that he will not use shared mobility nearby Amsterdam because there are personal modes of transport available. Abroad, this respondent will not easily use a shared car, as the following quote proves: "And then I would

never actually use a shared car so quickly. Maybe when going abroad, but then you just rent a car if you go somewhere, so no" (EPLE#4).

Although one respondent indicated that he had no intention of renting a shared e-scooter in Amsterdam, another respondent expressed interest in this: "I would rather be interested in something from a shared e-scooter than in a shared car, because I just own a car" (EPLE#1). The reason for this is the speed and the lack of parking problems: "Then the shared e-scooter could really be an added value for me" (EPLE#1). For example, when the employee wants to go to the Zandvoort circuit, that becomes very difficult by car, according to the respondent. On such a day, a shared e-scooter would be a solution not to depend on public transport.

Reliability

One of the employees indicates that they would be interested in renting a shared e-scooter. Not for a few hours, but for a whole day, for example, to go to the beach so that traffic jams and parking problems can be avoided. In addition, a reliable product is expected: "And I would like to pay some money for an e-scooter for a day's rent, but only if you have the certainty you will not be bothered by it at all" (EPLE#1).

Sustainability

Sustainability plays a significant role in factors that influence employees' intentions toward shared mobility. It is indicated that shared mobility is likely to be used more if the mode of transport is electric or has zero emissions. Also, the area has the ambition to become more sustainable.

Flexibility

The fact emerges that shared mobility must be more flexible to increase use. One of the respondents indicates that they would like to use a car quickly and flexibly: "If I had planned it in advance and I knew I needed to do this thing and it wasn't a spontaneous decision, then I would be happier to be flexible and go pick up a car" (EPLE#4). In addition, it is indicated that the need changes in a shared car and depends on the need at that specific moment. An example of this is described as follows: "If I drive to Amsterdam on my own, I don't need a very large car. But if my kids need a car on the weekend to get away with hockey, you might need a bigger car again" (EPLE#5). This is emphasized by Strömberg et al. (2018) who argue that freedom of choice is about having the option for different versions of one mode of transport such as a shared electric city car or shared family car. Flexibility is about the easy availability of those options at different times (Strömberg et al., 2018). This is consistent with the fact that great diversity in supply will increase freedom of choice and flexibility, which will increase accessibility according to Spickermann et al. (2014). An increase in freedom of choice will lead to greater flexibility and a higher intention to use shared mobility. Besides, it appears that a flexible mobility budget that can be used on one day of public transport, the next day by bicycle and the third day when it rains with the shared car, increases the chance that employees will use shared mobility.

Spatial environment

Regarding the spatial environment, a number of employees indicate that their intention to use shared mobility could be increased if the shared mobility can be found at a specific location nearby. This is in line with Stevenson (2016) who describes that if areas have a higher density this has a positive effect on the distance travelled by car and results in higher use of modes

of transport other than the car and general lower car ownership. A place nearby where it is possible to pick up and park different modalities: "But if there was such an E-Hub, you could just conveniently use the vehicle and return it" (EPLE#2). According to this respondent, there are increasing opportunities here for shared mobility, such as on the Mahlerlaan (which is in the centre of the Zuidas), which increases the intention to make use of it. One of the experts confirmed that cities and municipalities are working on a vision of mobility hubs in strategic places in the city. Shared mobility will become available here via a MaaS provider. Parking problems are mentioned several times as a disadvantage for using your own car and are cited by several employees as the reason in which the spatial environment can play a role in the intention of shared mobility when there are no longer any problems with it. This is in line with Knuiman et al. (2014) who argue that infrastructure has an effect on the type of transport and to what extent people use a mode of transport. On the other hand, one of the employees indicates that the intention concerning shared mobility has not changed much since the area in the Zuidas area has already been set up properly: "But I don't know how heavily it would be used, especially in Zuidas, just because everything is so convenient there" (EPLE#4).

Ease

According to a number of respondents, their intention towards shared mobility would increase if it becomes easy to use it. One of the employees describes the situation very aptly: "Look what a pity, of course, that you need a separate app for everything. That always remains inconvenient and that would of course be very nice if there is one app that contains everything, but that may also be a utopia" (EPLE#5). Sochor et al. (2016) agree that the ease will decrease when all mobility services are offered via one app.

In addition, the use must be easy, which also means that one does not want to plan too long in advance to be able to use shared mobility. It also appears that not every respondent is confident that making it easier leads to more use. It is expected to still be a hassle. A solution to this is to use the phone instead of a card. Needing a card for, for example, a OV-bicycle is experienced by one of the respondents as a barrier. The possibility to use shared mobility by telephone would be ideal for this. Finally, overall there is a fairly positive intention, but conditions are set: "I would like to use shared mobility, I really believe that is the future. But it shouldn't cost you more money and it shouldn't be uncomfortable either" (EPLE#5).

Cost

Cost considerations play a significant role in employees' intention to use shared mobility. This results in the fact that it should be comparable to other modes of transport. So if public transport is much cheaper, people still go by public transport if there is no rush involved. But it must also be economical. According to the employees, the OV-bicycle is cheap and with a lot of mobility services, you are above that amount. This would increase the intention, but: "There is still a challenge for other transport companies to win that" (EPLE#3). So if shared mobility is a little bit more expensive, it will be accepted. The condition is that it provides comfort and security. In that case, one of the respondents would like to pay a few tens for the daily rent of a shared e-scooter, for example, to go to the beach. Another employee also opts for a shared e-scooter, not a huge consideration because they are already pretty inexpensive. However: "But for a shared car, then cost would be a factor. I would weigh it against other options" (EPLE#4), which makes it clear that there is a difference in the role of costs in the intention compared to the shared e-scooter and the shared car. This is in line with Holmberg

et al. (2016) which argue that different user groups have different willingness to pay for the mobility service.

Travel time

A shorter travel time, or a faster vehicle, is preferred if you opt for shared mobility. Especially when this is compared to the travel time by public transport, as the following respondent agrees: "And I would, therefore, choose shared mobility if it is faster than public transport. Then I would choose it" (EPLR#2). When costs and travel time are optimized, the intention will increase, according to a number of respondents.

5.3.2 Intention among employers

As highlighted in the first paragraph of this chapter, there are a number of factors that apply to the intention to make use of shared mobility among employers in the Zuidas. In general, the intention is present among the respondents, as witness the following quotes, for example: "In principle, you are of course open to this because it contributes, of course, to what goals we also have from a socially responsible point of view" (EPLR#3). Also, the will that exists among companies is mentioned: "But the intention is there to get there, and I think also within the Zuidas they are really now working more and more towards getting these facilities in place" (EPLR#4). However, there is also doubt about the benefits of shared mobility: "On the other hand, it is not so much of added value now, because we can already solve it now" (EPLR#3). The various factors are shown below.

Accessibility

From the perspective of employers, it can be concluded that shared mobility is seen as an extra for the staff, this is evident from one of the respondents: "Suppose someone wants to get that sandwich during the break, for example, which is just a little further than you take that bicycle. It is just that little bit extra for convenience" (EPLR#3). About the offer of shared mobility, several respondents argue that their intention to facilitate it is based on the range in the market: "The offer should simply broaden because the need also broadens" (L). That offer is crucial and not only in Amsterdam, but preferably a national coverage: "We would really be in favour of more options and then really not only Amsterdam but really around the entire country" (EPLR#4). The current limited supply means that the intention in terms of accessibility among employers is low, as confirmed by this respondent: "I think it will take a while before it comes to that" (EPLR#3).

Habit

As discussed in the proceeding section, a number of employers offer shared mobility and some do not (yet). The intention to facilitate this involves arguments surrounding employee behaviour. The question from employers is: "Do people go along with this or do they really stick to the behaviour they have been showing for years?" (EPLR#3). This is brought to the table because, according to the respondent, there is a luxury problem. Traveling by your car is still too obvious. In addition, there is an intention from the employer to adjust this: "If that has not changed yet, we must first turn some buttons before we may be ready for it" (EPLR#3).

Ease

In addition to reliable service, shared mobility should also become easier according to several respondents to increase the intention to use. It states: "It just needs to make the travel even

easier than it already is" (EPLR#4). The same employer indicates that the NS Business card is the most interesting platform since all employees now work with it and the costs are deducted in this way. They would, therefore, find it easy if shared mobility, such as Felyx, would be connected to the NS Business card.

Another company, which facilitates two shared cars from the office, points out that the intention becomes greater if a kind of "black box" is placed in the car so that you can reserve it with an app. When someone makes a reservation in the app, they get access to the car from the same application, where there is then a key in the dashboard. That way, journeys can be easily registered. Outsourcing maintenance, damage, and cleaning ensure that the intention to use shared mobility is increased by more convenience for the employer.

Cost

In view of the processing of travel costs, the costs of shared mobility obviously play a role for employers in their intention concerning shared mobility. Functionality and combination with costs: "In terms of costs and terms of functionalities, you prefer to have everything together" (EPLR#3).

In the field of shared mobility, however, there are a number of conditions that influence the intention of employers. For example, if an employee lives at a commuting distance that can be bridged with a bicycle, there are special regulations that apply to a bicycle or e-bicycle, so that shared mobility does not add much and the intention is therefore lower. Another point of attention through which costs negatively affect the intention of shared mobility are the tax rules that apply. For example, when using shared cars for private use, this is not just allowed: "The tax authorities must also grow in this" (EPLR#1).

Another aspect that counts in the relationship between the costs and the intention for shared mobility is the fact that, in contrast to a mobility budget or public transport card, lease cars can also be used in private time. And that while traveling with the NS Business card outside the office days are not reimbursed. This gives an advantage to the lease car, which reduces the intention concerning shared mobility.

5.4 Mobility as a Service

After identifying the factors that play a role in the attitude and intention towards shared mobility, this section further discusses the elements which determine the added value of MaaS. The previous paragraphs have shown that cost considerations and compensation from the employer play a role in the choice for shared mobility. Employers, on the other hand, are positive about MaaS and would like to gain more insight into the transport choice of their employees. This is to adapt these wishes into the existing offer, but also provide feedback on travel behaviour where necessary. MaaS is not only the facilitation of shared mobility in one integrated mobility offering but also the provision of a personal travel planner. It can offer advice on various types of travel, such as the cheapest, the fastest, or the most sustainable. Finally, the opportunities of MaaS in the Zuidas region are discussed that emerged during the interviews with experts. Where are the possibilities, but also the limitations? The factors which are involved in the added value of MaaS are discussed in the following three sub-themes in this section: (1) the expectations of employers on MaaS, (2) the requirements a new travel app should meet, and (3) the opportunities for MaaS in Zuidas. One of the employers that has been interviewed already has experience with MaaS, of which an emphasis can be found in textbox 1.1.

5.4.1 Expectations of employers on MaaS

One of the main concerns that employers mention in subparagraph 5.1.1 is the lack of understanding of the way employees travel. On one hand, this is in the mobility allowances; because this is a fixed amount per month, the employer has no overview of which mobility people use. This also concerns travel allowance because when someone reimburses nineteen cents per kilometre, the employer does not yet know how the employee has travelled. One of the respondents elaborates on this: "While someone reimburses 19 cents, you still don't know how someone travelled. So you can't talk about that like "you declare 19 cents, so you go by car?". But that "so you go by car" is not correct, because I always declare 19 cents, but I always go to Amsterdam by public transport. Because you have that choice. You can choose that 19 cents or hand on your train ticket. I choose 19 cents, but I will take the train to Amsterdam. So it doesn't say anything either, simply because we don't know about how someone travels. Then you cannot point out the alternatives to anyone" (EPLR#1). Another respondent has pointed out that it has been tried in the past to provide employees with feedback about their travel behaviour, but this is sensitive in the context of privacy in the form of AVG and GDPR. Besides, there is no clear insight into the number of business trips that are made, because this is only known for the employees who receive compensation via the salary, but the frequency is often uncertain. As long as there is no insight into travel behaviour, it remains difficult to influence behaviour, according to many employers. This is one of the most important wishes of employers, which is explained in more detail in the next section.

A flexible mobility policy in which the choice can be made between public transport, bicycle, and (shared) car is seen as an essential challenge. Some employers have confirmed that they are working on an update of their mobility policy in view of these developments. There is talk of both an awareness component and a discouragement policy to reduce commute traffic by car. One of the employers mentioned that in the future only electric vehicles may park at the office and that public transport will become more important. Employers will become increasingly responsible for this. Influence also plays a certain role: "So indeed also from the

influencing aspect, how can you promote some things better and what can we learn from that?" (EPLR#3). The employers who signed the MaaS Zuidas Framework Agreement show that insights into travel behaviour play an important role in participation and that they are interested in new forms of mobility. Other reasons are the reduction of the number of cars in the Zuidas and at the same time what is imposed by the municipality of Amsterdam.

The major advantage of MaaS that is proposed by several employers is that it shows the alternatives and that you, as an employer, gain insight. Partly from the point of view to encourage employees to travel in other ways than by car and, on the other hand, to collect data on visitor flows. It is expected that the employer can exercise a certain control, which is best done with a kind of dashboard. That dashboard is based on the series of business travel transactions that the end-user can find in the app and for which feedback is provided from the back office and settlements. Information and feedback appear to be important in encouraging individuals to make desirable transportation choices (Andersson et al., 2018). In such a case, MaaS could contribute to awareness among employees by showing that the journey can also be done in another way: "Hopefully this will make them more aware and think of 'If I get in the car I will take an hour and by train three-quarters of an hour, I didn't know that at all - then I am going by train today'. So that way. And then immediately gain insight from the employer side, that this brings you closer to steering or at least can communicate more specifically" (EPLR#2). On the other hand, the same employer mentions that, although employees in a MaaS app would be easy to indicate that a trip is private and must, therefore, be paid directly, the question is whether this is desirable.

In addition, some employers expect shared bicycles, shared cars, or individual cars or which another form of transport is available and that they can be used via the MaaS app. Sustainability also plays a role here because employers do not want to make their footprint large: "You are already an international company with many movements, so you want to have as little impact as possible" (EPLR#6). This ambition to become more sustainable in the area is in line with the desired spread, so that people will travel outside rush hour. The employer who already has experience with MaaS providers also mentions that on the basis of this the costs play a significant role: "But they must also be keen on the price. Because an argument was also, for example; I have the app from Car2Go, the app for HelloBike, the app for I know what, then I only have three apps on my phone, but then I am cheaper than when I take out your subscription" (EPLR#6). It follows from this that a MaaS provider must be sharply priced. Preference is given to a kind of basic subscription, just as with ParkMobile, according to one of the employers. You pay very little per month, but every time you use you will be charged for this. This corresponds to the public transport cards that are used; when it is used, payment must be made, but if the card is not used, a very low basic rate is paid by the employer. These kinds of solutions are considered to be the most workable. One of the employers already has experience with MaaS, which is particularly valuable for this research. An emphasis can be found in textbox 1.1.

Textbox 1.1 Experiences with MaaS

One of the employers reports that they themselves have conducted internal research into the provision of MaaS to their employees: "At the time, we looked at a MaaS provider who could choose all kinds of transport for an employee for a specific amount of money per month within a range established by the employer. The problem with this was that the range

was limited because this actually only applied to the city. If someone lived further away, the budget was not enough, because you could not take a taxi from Amsterdam to Sassenheim” (EPLR#6).

In addition, the MaaS trial was investigated in Finland: "There is also a provider that is quite far in that" (EPLR#6). However, it was concluded that it works as desired in Helsinki, but not elsewhere. The bottom line is that MaaS does not work if you don't have mobility at your door. It depends very much on that. However, this employer has attempted to bring the product to the Netherlands, but contracts with transporters had to be concluded in Amsterdam first. This made it inexpensive and expensive for employees, as less mobility was available for the available budget. In addition, it is mentioned that when employees had to travel a little further, that was not possible. Or if they had to have a taxi to the airport early in the morning, they couldn't. In short; there were so many restrictions that it was not a good alternative.

The company has asked what employees would like via the Works Council. Among those employees was also a person with a lower mobility allowance, which would give them a lower subscription and therefore less flexible choice compared to the existing situation. Based on this, no positive result was achieved. Also, adjusting the policy for this is a complicated exercise because certain matters such as terms of employment apply and a Works Council would not immediately agree.

In conclusion, it can be stated that, according to the employer, it is not really possible with some providers to offer MaaS because it always has more disadvantages than what is currently used. The development of MaaS was then still in its infancy, so it did not match what the employer was looking for. Employees should be able to choose what they want to choose according to the employer, which is why people are also interested in a fully-fledged MaaS solution: "So that's why we said if we would introduce something like that again, it really should be such a MaaS solution because other than it simply offers too little" (EPLR#6).

It can be concluded that there is a particular interest in a MaaS provider that offers insight into the travel pattern of employees and provides them with alternatives. In addition, an attractive price and displaying sustainable travel is a promising option. Although there are some concerns, employers generally believe that MaaS can provide a solution: "But indeed somehow, it is the future" (EPLR#6).

5.4.2 Requirements new travel app

Before it can be sketched what needs there are in a MaaS app, it is wise to first pay attention to the current appreciation of existing travel planners and shared mobility apps.

Valuation available travel planners

First of all, several respondents indicate that they hardly use a travel planner, because this is not considered necessary given the fact that a fixed route is being travelled or that waiting at the stop is not a problem: "And whether I have five waits at the stop for minutes or twelve minutes, that doesn't matter" (EPLR#1). Another employee indicates that this meets the need

in combination with the Uber app.

Of the travel planners, the 9292 app is the most frequently mentioned. Some respondents use the app weekly, others several times a year to check whether certain lines have changed. Where some respondents are satisfied with the 9292 app, such as the following: "And 9292 always works great for planning a trip with different public transport modes to areas. It is also very popular, at least for me" (EPLR#3), others are more critical: "It does what it should do, let's just say" (EPLE#5) and "I think it's a really terrible app to use" (EPLE#3). The main disadvantages are that the current travel time is not always displayed and that the correct option is not always displayed so that the respondent knows other options. People are generally more satisfied with the Google Maps app. Other apps that are used are the Waze app for driving that provides the correct traffic information and the NS app for train travel. One of the employers indicates that he uses the ANWB tool to calculate the distance that employees travel because it is very reliable. Incidentally, one of the respondents indicates that they have sometimes used the Citymapper app, one of the available MaaS apps, but find it annoying that the app can only be used in the Randstad: "If I have to go to that village, then that thing says: that is outside the Randstad, we are not going there" (EPLE#3).

When attention is paid to the appreciation of shared mobility apps, it can be concluded that they work easily. One of the respondents says about the use of the Car2Go app: "It is becoming easier with your phone to open and close things and it is all automatic. So that's easy. I think that is very simple" (EPLE#2). The ViaVan app is also positively appreciated. The commitment to be shown to download the app and registration for use are not perceived as a concern. Even if an app has to be downloaded for one or two uses, according to one of the employees, this is not an issue: "Just fill in payments and personal data, but that was not really complex" (EPLE#3).

One app

Almost all respondents, even though using the app itself is quite easy, mention that their interest in using a travel planner or shared mobility app increases when these are not several apps, but one. This is in line with König et al. (2017) who noted that more mobility services are accessible in MaaS by offering them via a single ICT platform comparable to platforms such as Airbnb and Netflix. This remains inconvenient and the user always has to switch to what is best. The respondents say about this: "Not that you need four different apps on your phone and then always have to switch to what is best. If you could do that from one thing", bundling it together would provide much more overview, but that would also give people more opportunity to try different things. So I think that also makes it more accessible when you talk about sharing mobility" (EPLR#3) and "Look what a pity that you need a separate app for everything. That always remains clumsy and that would of course be very nice if there is one app that contains everything, but that may also be a utopia" (EPLE#5). The same respondent later mentions: "You prefer that you already have that app on your phone as standard" (EPLE#5). This all is supported by Sochor et al. (2016) who found from the UbiGo pilot in Gothenburg that by offering all mobility services via one app, participants have received a new insight into what convenience interests to them.

Not only the integration of various apps in one but also the clear presentation of the various providers in a MaaS app is seen as a major advantage, the following respondent confirms: "And also to just have all the options there. So if you come to the station, you know there is a

Felyx, but you can also do this and you can also do that, like all these different kinds of that. You have all the options mapped, just a one in one app” (EPLR#4). According to one of the employees, the condition for this is that the MaaS app covers the entire trip.

Cost

When attention is paid to the costs, the prices of both public transport and the shared car should be compared directly to each other. This is consistent with Chorus and Dellaert (2012) who discovered that when the price of the travel alternatives is only known during or after use, people generally choose less quickly for that option. An option offered by an employer is that the employee can indicate whether it is a private trip so that it can be paid directly. The other side of the question is whether you want all that in connection with privacy. One of the employees joins the claim option and would have an app that easily tracks which mode of transport they are using. So, for example, the bicycle kilometres, which still have to be entered manually, are automatically processed.

Personal advice

The majority of respondents come to the conclusion that they are interested in displaying the most sustainable way of traveling in their travel advice in order to make the most suitable choice. As one of the respondents describes: “Because I think a lot of people find that important, only they cannot always make a good decision. So if that is shown as “very simple, this is the most sustainable way”, I really think more will choose for that too” (EPLE#1). Another wish aimed at more sustainable travel came from an employer who, in addition to the fastest route, would also like to show the amount of CO₂ emissions saved. Vitality is also mentioned as one of the travel preferences. This is in line with Andersson et al. (2018) who argue that feedback and information appear to be significant in stimulating people to make desirable transportation choices. Although one of the respondents indicates that they are interested in the most vital and sustainable route, they are also critical about whether they will actually use it: “What is the healthiest route? What is the most sustainable route? So yes, I will certainly be interested, but will I often use it? No that doesn't change because I don't get into the situation. But I do find it an interesting one” (EPLE#1). Another respondent agrees and thinks the time is the most important factor, but still thinks that sustainability plays a role and believes in a combination of these two factors.

When considering the functionalities of a MaaS app, some respondents stated that above all it should work efficiently and easily: “When I am traveling I just want to find out my journey in a few clicks or check the most efficient route for me. It has to be quick, clear, responsive to my habits so that I quickly know which train to take that best suits my situation at the moment” (EPLE#3). Thinking along with the user and immediately indicating what is most convenient is a frequently heard wish. So that choices can be proposed based on the habits of the traveler. For example when traveling during rush hour the metro is less appreciated, so the MaaS app could offer a bicycle. This is consistent with Stopka (2014) who suggests that people benefit from personal travel options specific to their situation will help to change their travel behaviour. Based on the pattern that the app recognizes, a proposal is made about the way back home or the expected mode of transport at that time. Not only would several respondents receive a notification of this, but a message that one could take the bicycle is suggested by one of the employees: “I also like it if you get a reminder of it; the last 3 days you went by public transport, otherwise try the bicycle” (EPLR#3). Following Lathia et al (2013) mobile devices and apps will become central in providing access to real-time and tailor-made travel solutions in specific

locations and through the simplicity and wide acceptance in use. This is endorsed by some respondents who are interested in a travel app not only for cars that also has a user-friendly user interface. One of the respondents would like to see a check-in and check-out functionality in the app to replace the OV chip card: "So I think that the ability to check something out with your phone would be ideal for me" (EPLE#4).

Mobility services

In addition to the certainty that shared mobility is available, a wish has been put forward that all travel options are facilitated. Think of a multimodal travel by using a combination of car or bicycle with public transport: "I think it is very important that a shared mobility app offers a wide variety of mobility services. When considering trips not only train and a car are suggested, but also the combination of a bicycle and public transport" (EPLE#5). The same respondent also suggests that traveling with shared cars could be promising and that self-driving car would be a solution for those: "Ideally you have self-driving cars at a glance and they drive themselves at the door. For me, that is the ultimate MaaS experience" (EPLE#5). One of the employers also mentions processing the locations of the customers and explaining the best travel option as a wish related to offering travel advice. Another employer concludes that there is a significant need in a MaaS app: "The offer just needs to broaden because the need also broadens" (EPLR#6).

All in all, the vast majority of respondents are interested in a MaaS application given the positive intent that both employees and employers have. However, there are also some critical voices when it comes to replacing existing trip planners as some of them already meet the need: "Quite a lot has to be done or there must be something really special in another trip planner before I go to replace my current planner. Then you have to do your best because it is so complete" (EPLE#3).

5.4.3 Opportunities MaaS in Zuidas

According to the experts, there are different approaches to the opportunities of MaaS in the Amsterdam region. First of all, it emerges that Amsterdam, and in particular the region of which the Zuidas is a part, is the busiest region in the country in terms of transport. In an area of about one and a half million people, there are almost five million trips (all travels) per day². It can be observed that junctions and stations are under increasing pressure. In addition, it is increasingly difficult for existing public transport options to go along in traffic because traffic jams cause roads to clog. For this reason, the R-Net concept (fast bus lines with a high frequency) was introduced a few years ago. This has led to exponential passenger growth because the higher frequency has made it more attractive for more people to take the bus. This is consistent with Karlsson et al. (2017) who concluded from the UbiGo pilot that public transport was chosen not only because the boarding places are close but also the fact that they can board frequently. The frequency increases, the speed increases. In the morning rush hour, not only the trains between, for example, Haarlem to Amsterdam South are overcrowded, the buses that are used are also fully filled. And that while rush-hour buses with over eighty seats and a frequency of five minutes are offered. However, the greater the distance to a stop: "The greater the threshold for using public transport" (EXP#1) according to one of the respondents. The increase in distance to the bus stop means that public transport

² Based on the numbers of the situation before Covid-19

is increasingly perceived to be more than timetable and operation, but also that what takes place before and after the stop is becoming increasingly important. This offers opportunities for demand-dependent transport, with which experiments are conducted in sparsely populated areas around Amsterdam, and connections to shared mobility and MaaS.

Flexibility

This issue fits in seamlessly with offering a total product and solving the first and last-mile challenges, for example by means of shared bicycles: "So I think that it is becoming increasingly important to take apart before and after the main journey" (EXP#1). In addition, it is not financially viable in a sparsely populated area to run a bus empty one, two, three, or four times an hour. For this, a shared car would be a suitable option to use once.

Zuidas employees

For the business travellers on the Zuidas, one of the experts suggests that employers may have to do things completely differently from the start. When a new employee is hired, a MaaS card could be offered instead of a company car. The same applies to employees employed: "Or that at the start of a new contract you say "Well, you do not get a car, but you get a subscription for the train and for the shared car." Then you don't have to change the behaviour that wasn't there yet" (EXP#2). The same expert argues: "You have a MaaS offer as an employee and you can choose something yourself. You can travel at any time as it suits you best" (EXP#2).

Offer

The aim of MaaS is clear to the experts, namely: "Yes, that is, of course, the idea that you choose the vehicle or the mode of transport that is best at the time" (EXP#2). However, various carriers are required for coupling these means of transport. There is still a lot of competition between the carriers in which it is thought that the traveller should come into the relevant app because they have their own system and that also earns money. One of the success factors of MaaS lies in the willingness of carriers, in collaboration with shared mobility services, to provide cooperation. This corresponds to the connection via an information platform based on GPS and ICT which is forecasted to play an more and more significant role in constructing travel behaviour (Gössling, 2018). One of the experts described the following:

"Part of the success factor is that you see the same importance with all those carriers together. So they understand "Okay, we would benefit if we make sure that all the information we have, but also that our fellow carriers have, that it ends up in such an application to facilitate that traveller in the best way to go from A to B. And for that traveller it generally does not matter whether they travel with Connexxion or with the NS or the GVB or a shared car X or Z" (EXP#1).

Area development

One of the options for MaaS proposed by one of the experts is the combination of area development. The municipality of Amsterdam is building completely new residential areas. It could be argued that certain standards will be applied there. At the same time, this could be tendered for certain mobility providers who subsequently offer MaaS to the residents. In that case, residents do not receive a parking garage but a subscription to the MaaS provider. Also, cities and municipalities are working on a vision of mobility hubs. These are strategic

places in the city where shared mobility becomes available with a MaaS provider: "Sub-vehicles will become available there with a MaaS provider" (EXP#2).

App

The experts' wish for a MaaS app is that all travel options are offered. The best travel advice based on a profile in which you can set, for example, do not mind traveling in rush hour or having to change twice. One of the experts describes the size of the various profiles grafted on the Zuidas: "You also have to remember that there are 40,000 people in the Zuidas, so that is 40,000 different people from which you can get four or five different traveller profiles. Or maybe twenty or thirty in terms of travel needs and wishes and such and I think such an application should be able to respond well to that" (EXP#1). For one traveller the costs from A to B play a major role, while this is of no interest to the other traveller when the fastest option is more expensive by default. Every type of traveller should be well facilitated.

Another promising proposal, according to one of the respondents, is to be able to leave a review about the shared mobility provider or vehicle used. Similar to ordering a product over the Internet, people want to know what other people think about it before they spend money. Does it match their expectations? In case a trip with shared car X is suggested in the travel advice, it would be practical to check the reviews: "Because all those 100 people who used a shared car X for you, what they thought of it" (EXP#1). About this quality, another expert states that good service is an important success factor of MaaS. Swapfiets is cited as an example of this, whereby the service is experienced as good: "So look at a Swapfiets is also a kind of MaaS, which I also see as mobility as a service. You don't buy a bicycle, you buy mobility. And if it's broken, they'll pick it up. They don't have to provide a bad service three times, because then you also think I just buy a bicycle myself" (EXP#2). This is supported by Sochor et al. (2015) who argue that the degree of simplicity of the UbiGo pilot improved participants' confidence that any problem could be solved immediately using the platform.

In addition, according to the expert, work is done at a national level to allow travellers to pay with their bank card. Ultimately, the most important thing is that the MaaS is as natural as Google Maps when traveling by car. But above all an easy and user-friendly app: "The main opportunities are that the product must be user-friendly in all respects" (EXP#1).

Incidentally, one of the experts is critical of the exaggerated amount of attention that MaaS receives: "I mean it has long been sort of the magic word as if MaaS would solve this problem. That is not the case, in my opinion, MaaS is only a platform and app, something to plan your trip and also to pay immediately" (EXP#1).

Monitoring

To evaluate the implementation of MaaS, one of the experts proposes to monitor how successful the various shared mobility systems are. When it is decided to park shared cars somewhere and it later turns out that they actually stood still for 364 days, then it could be investigated why this is the case and what could be done about it. So the need to monitor is there. Then it is assumed that people would like to steer based on the data: "After that comes the steering question, of course, I mean: if on one hand, you see that it is super successful, then you may have to start thinking about expanding" (EXP#1). The downside of MaaS, in this case, is the dependence of mobility services, one of the experts describes: "So it facilitates something, but you don't have the physical offer on the street" (EXP#1).

Car traffic is getting busier and that is why, according to one of the respondents, more should be invested in alternatives to compete with the car. In addition, success is determined by offering all options in one and that one can see how other people have experienced those transport options. Also, spatial planning plays a role by offering MaaS in area development and the development of mobility hubs. According to the experts, MaaS gives the user more space by being able to choose what works best at any time.

5.5 Synthesis

In the previous sections, the various results regarding the attitude and intention towards shared mobility, and the elaborations thereof, were mentioned in MaaS. In this section, these are presented as a synthesis using the Theory of Planned Behavior.

Attitude, referring to a person's negative or positive sense of a certain behaviour, which is an important antecedent of the Theory of Planned Behavior that has been empirically shown to promote intention (Kusumawati, Halim & Said, 2015). In this thesis, attitude is defined as the preferences of employees and employers when using shared mobility. That there exists a relationship between attitude and intention has been shown by Farahbod et al. (2013) for example. Considered is that when a person has a positive attitude towards a particular circumstance, likely it will influence the intention (Lee, 2009; Shah, Aziz, Jaffari & Waris, 2012). For example, a study conducted by (Kaplan, Manca, Nielsen & Prato, 2015) suggested that tourists' intention to use a sharing bicycle initiative is certainly influenced by the attitude concerning bicycle sharing. So, if a person has a positive sense about a shared bicycle initiative, they will more often choose to utilize it.

When attention is paid to the attitude of employees and employers in the Zuidas towards shared mobility, it can be stated that accessibility, reliability, and flexibility are determinants that are experienced as positive towards shared mobility. In addition, the spatial environment, the costs, and the sustainability factor play a role in favour of shared mobility.

However, the list of determinants that play a role in the choice not to opt for shared mobility is much more extensive. This includes the aforementioned (accessibility, reliability, flexibility, spatial planning, and costs), which means that in some cases and depending on the respondents, these factors are experienced as both positive and negative. An example of this is accessibility; while one respondent thinks the presence of the OV-bicycle is more than sufficient, other respondents are convinced that the limited supply of, for example, types of shared cars means that this is an argument not to opt for shared mobility. In addition, the determinants of autonomy, effort, travel time, and ease also play a role, as a negative valuation of these results in a lower attitude. Finally, habit is also mentioned as a reason not to opt for shared mobility.

These factors together ensure that when these concerns are adjusted or improved, it leads to a high or higher intention. These ensure that when the respondent indicates that he is interested in shared mobility or otherwise shows the intention to use it. This includes both wishes and conditions. Accessibility, ease, and costs are of great importance to both employees and employers. Higher accessibility, an (even) easier user experience, and lower costs would increase the intention to use shared mobility. In addition, employers conclude that the habit of the travel behaviour of employees is of considerable importance. From employees, this is not explicitly mentioned as a determinant that plays a role in the intention, but instead, sustainability and flexibility are raised. If shared mobility would be more sustainable, for example by offering only electric vehicles, and the use of shared mobility would be more flexible, for example by offering more types of shared cars, which increases freedom of choice, this will result in a higher intention. That freedom of choice is reflected in the determinant autonomy, where there is a greater interest from employees when, for example, there are free-floating shared cars with national coverage. Regarding the spatial environment, a number of

employees indicate that their intention to use shared mobility could be increased if the shared mobility can be found at a specific location. This offers opportunities for the development of a mobility hub. Providing a reliable product would increase the intent of at least one employee. Finally, a shorter travel time compared to public transport would increase the intention towards shared mobility.

This combined intention offers a nice insight into the adaptation to use MaaS, but is not yet sufficient. MaaS is offered as more than just facilitating shared mobility. One of the distinguishing factors is the merging of mobility service via a single platform (König et al., 2017) such as an app that makes it a very accessible mobility system for the user. It can be concluded from the Results that the interest increases if one travel app for shared mobility can be used instead of several apps. In addition to that positive factor, offering personal travel advice is also suggested as one of the reasons that can increase the adaptation of MaaS according to Atkins (2015). There is interest in this, particularly aimed at the most sustainable and vital travel option. In addition, respondents wish that a MaaS app can think along with the user by responding to the habits of the traveler and in this way be able to offer a tailor-made travel solution, as suggested by Lathia et al. (2013).

Note that the attitude is not the only predictor of the intention and thus the ultimate behaviour; also the subjective norms - the experience of what an individual thinks other people expect of that person (Baron & Branscombe, 2012) - and perceived behavioural control - the extent to which someone thinks they can actually perform the behaviour (Baron & Branscombe, 2012) - are of importance.

Although there is only limited literature available regarding the adaptation of MaaS by means of Theory of Planned Behavior, it can be deduced that the results regarding attitude and intention are in line with the conclusions of various studies (Bamberg, Ajzen, & Schmidt, 2003; Collins & Chambers, 2005; Ambak et al., 2016; Zailani et al., 2016). It can be suggested that the greater the intention, the greater the motivation to actually perform a specific action, such as the adaptation of MaaS in this case.

6. Conclusions

For employees and employers on the Zuidas, MaaS potentially attempts a mobility offer that is fully tailored to the wishes of the traveller and offers flexibility in the choice of transport mode. This thesis has attempted to present an indication of the transport choice of employees, to display the attitude and intention towards shared mobility, and, based on this, to map out a connection with the wishes and conditions for MaaS. The main question is:

“To what extent do the attitude and the intention towards shared mobility of both employees and employers in the Zuidas contribute to adapt MaaS and how can its use be stimulated?”

This research was designed based on the Theory of Planned Behavior (Ajzen, 1991); which appears to be an excellent predictor of sustainable travel given the theory. This can rightly be concluded from the results. Since MaaS currently does not exist anywhere else in the Netherlands, apart from a number of (small-scale) projects abroad, this thesis worked with one of the most important distinguishing features of MaaS - the integration of shared mobility. The main shared mobility options at the moment are shared cars, shared bicycles, and shared e-scooters. The advantage of this approach is that these services have already been rolled out in Amsterdam and on the Zuidas specifically, while no MaaS provider exists yet. In order to investigate the opportunities of MaaS aimed at employees and employers, interviews were held among employees and employers in the Zuidas and experts. Their choice of transport, attitude, and intention towards shared mobility and expectations for MaaS were discussed.

Three sub-questions have been formulated to answer the main question:

1. "Which factors play a role in the attitude towards shared mobility?"
2. "What factors apply to the intention towards shared mobility and what conditions must shared mobility meet to make its use more attractive?"
3. "Which elements determine the added value of MaaS?"

Attitude

This thesis not only looked at factors to choose shared mobility but also which factors apply when choosing not to choose shared mobility. First of all, the positive attitude; In addition to the wide accessibility, the available reliability, the relatively low costs, and the convenient spatial environment, to opt for shared mobility, sustainability considerations and flexibility are particularly important. The first is because both individuals and companies increasingly base their transport choice and policy on reducing CO2 emissions. Sustainability and CO2 reduction are therefore arguments that motivate the employer to opt for shared mobility. This is in line with Eckhardt & Bardhi (2015) who describe that bicycle-sharing systems meet the growing focus on sustainable development due to its environmental friendliness. Especially young people want to behave more sustainably and the company feels that it also has to comply with this. The other factor that plays a role in the choice to opt for shared mobility is flexibility. The freedom of choice is increasing due to the presence of shared mobility which is approved by Spickermann et al. (2014) who mention that great diversity in supply will increase flexibility. Besides, flexibility is seen as an advantage when choosing a shared bicycle because it is flexible to take the bicycle when people want to go to different locations in the city. This

corresponds to Strömberg et al. (2018) who state that offering a mix of different mobility services increases the flexibility for the traveller.

Factors that also play a role in the attitude towards shared mobility, or in a negative sense, are in particular costs, reliability, and habit. Although the costs for a shared bicycle or shared e-scooter are not significant for the respondents, costs are mainly seen with shared cars as one of the most important barriers. This is in line with the Willingness to Pay (WTP) which can differ per mobility service and user group (Ratilainen, 2017). Especially for renting the shared car for a longer period, for a day to a client or a weekend away, the costs are seen as relatively high. Also, the costs of a shared car compared to your own car, especially given the attractive conditions that apply to lease cars. This is supported by Luca & De Pace (2015) who believe that travel costs still play the most important role when switching from a private to a shared car.

Another factor is reliability; when using shared mobility, it is not always clear what the costs are. This is supported by Chorus and Dellaert (2012) who discovered that people generally choose less quickly for that option when the price of the travel alternatives is only known during or after use. It is also mentioned that it is difficult to compare shared mobility services with public transport. This is encouraged by Kamargianni et al. (2016) who are stating that it is important to provide insight into the costs when offering a mobility service.

Finally, habit emerges as a factor that should also be taken into account. A shift from private vehicles to shared vehicles is assessed alternately. Given the sense of autonomy and freedom that the private car gives, people stick to it, which is endorsed by Karlsson et al. (2016). It is also argued that the way of traveling has become so standard that people don't often think about adjusting it which is supported by Chorus and Dellaert (2012) who discovered that people who dislike risks do not easily choose travel options other than those they already use.

In conclusion, it can be stated that the answer to sub-question 1 is based on the fact that the factors sustainability, flexibility cost, reliability, and habit play the largest roles in the attitude to shared mobility - sustainability and flexibility in the choice to choose for shared mobility and cost, reliability and habit apply in the choice not to opt for it.

Intention

Considered is that when a person has a positive attitude towards a particular circumstance, likely it will influence the intention (Lee, 2009; Shah, Aziz, Jaffari & Waris, 2012). This also applies to the flexibility factor. This research shows that the use of shared mobility grows when it is more flexible. It is indicated that the need in a shared car changes and depends on the need at that specific moment, a wider offer would increase the intention. This is emphasized by Strömberg et al. (2018) who argue that freedom of choice is about having the option for different versions of one mode of transport such as a shared electric city car or shared family car. Flexibility is about the easy availability of those options at different times (Strömberg et al., 2018). An increase in freedom of choice will lead to greater flexibility and a higher intention to use shared mobility which is also described by Spickermann et al. (2014)

The spatial environment on the Zuidas was mentioned in the attitudes as well as the factors that play a role in the choice of whether or not to opt for shared mobility. However, as suggested in this study, employee intent increases when shared mobility can be found at a specific location. This is approved by Stevenson (2016) who describes that when areas, such

as the Zuidas, have a higher density this decreases the distance traveled by car. This also results in higher use of modes of transport other than the car and general lower car ownership. A mobility hub where shared mobility is available would potentially increase the intention, and solve current parking problems. This is in line with Knuiman et al. (2014) that argue that infrastructure has an effect on the type of transport and to what extent people use a certain mode of transport.

Accessibility is a third factor that could increase the intention to use shared mobility. In general, it is said that it would be good if more shared mobility options were available. Especially, there is interest in a shared car system that allows affordable travel from hub to hub. This is supported by the employers who indicate that their intention will grow in the range of shared mobility would be increased, with a preference for national coverage given the different locations of customers of companies in the Zuidas.

In conclusion, it can be stated that the answer to the second sub-question is based on greater flexibility, a specific location for shared mobility, and more options and greater nationwide coverage. This will bring about a positive intention towards shared mobility among both employees and employers.

MaaS

When examining the distinguishing factors of MaaS, several options are raised. First of all, it is mentioned that there is great interest in an app in which all forms of shared mobility are integrated. This all is supported by Sochor et al. (2016) who found from the UbiGo pilot in Gothenburg that by offering all mobility services via one app, participants have gained a new insight into what convenience means to them. Also, König et al. (2017) who note that more mobility services are accessible in MaaS by offering them via a single ICT platform such as an app.

When attention is paid to the costs, the prices of both public transport and the shared car should be presented directly below each other in a MaaS app. This is consistent with Chorus and Dellaert (2012) who discovered that when the price of the travel alternatives is only known during or after use, people generally choose less quickly for that option. An option offered by an employer is that the employee can indicate whether it is a private trip so that it can be paid directly. A major advantage of MaaS following employers is that it shows the alternatives and gain insight. Partly to encourage employees to travel in other ways than by car and to collect data that can be controlled via a dashboard.

In addition, it is mentioned that there is interest in the most sustainable and the most vital way of traveling as one of the travel preferences. This is in line with Andersson et al. (2018) who argue that feedback and information appear to be significant in motivating people to make desirable transportation choices. This is consistent with Stopka (2014) who suggests that people benefit from personal travel options specific to their situation will help to change their travel behaviour. The desire is that the app recognizes, a proposal is made about the way back home or the expected modes of transport at that time. Key is that the app is so easy to use, which is consistent with Sochor et al. (2015) who argue that the degree of simplicity of the UbiGo pilot improved participants' confidence that any problem could be solved immediately using the platform.

In conclusion, it can be stated that the answer to the third sub-question is based on offering insights into travel behaviour for the employer, offering personal travel advice, and integrating as many mobility services as possible utilizing one app.

7. Discussion

In this research, interviews were used to test the attitude and intention, as described in the Theory of Planned Behavior (Ajzen, 1991), for the use of shared mobility. While there is still little literature available regarding the adaptation of MaaS utilizing Theory of Planned Behavior, it can be deduced that the results regarding attitude and intention are in line with the conclusions of various studies. Also, it can be suggested that the greater the intention, the greater the motivation to actually perform a specific action, such as the adaptation of MaaS in this case.

The approach of this research is qualitative. The reasons for this way of doing research are discussed in chapter 3, the Methods. Most studies into the motives for choosing a particular mode of transport, such as shared mobility, are quantitative. The advantage of quantitative research is that the results can be generalized, which is not the case with qualitative research. However, the qualitative approach of this research has made a major contribution to understanding the underlying reasons for whether or not to appreciate something. A combination of both quantitative research and qualitative research might have been the best option. In this way, on one hand, generalizable conclusions could be drawn about the factors that play a role in the attitude and intention of employees and employers towards shared mobility, and on the other hand, there could be further questioning about certain topics, for example in the form of a focus group discussion. A total of thirteen people were interviewed for this thesis, divided over eleven interviews. These interviews consisted of nine with individuals and two (both from the group of employers) consisted of two respondents. An interview was conducted with five employees at the Zuidas, four employers at the Zuidas, and two experts in the field of urban mobility in the Amsterdam region. An attempt was made to appeal to the widest possible target group. This broad approach means that the opinions of both employees and employers are included, which enriches the results. To reinforce the results of this thesis, the study should be repeated in a different context. The disadvantage of interviewing all employees and employers as a research population also means that not all respondents have already used shared mobility. The data obtained arose both employees who have ever used shared mobility and employees who have never or rarely used it. The same applies to the interviewed employers; some offered shared mobility, but another part did not currently. In addition, use of shared mobility varies to a large extent between the respondents; some make regular use of shared mobility, while others have occasionally been on a OV-bicycle. For the reliability of the interviews, it might have been better to interview respondents who have a certain degree of experience in the use or facilitation of shared mobility. Furthermore, as can be read in chapter 3, the respondents were partly recruited via the network of the Green Business Club Zuidas. In most cases, indirect contact was then made with the ultimate respondent, but this could have had an influence on the research results and specifically on the value of sustainability when choosing a mode of transport. The attitude towards shared mobility could be more positive for that reason.

As expected the focus of this thesis turned out to be quite broad due to questions about attitude and intention, but also about, for example, the use of travel apps and the interest in a MaaS app. In addition, it must be taken into account that this research has focused exclusively on indicators for transport choice and attitude in combination with intention towards shared mobility. Once the focus is on travel distance, political beliefs, or household characteristics,

the results may be different. Also, for a complete picture of the respondents' intention, attention should be paid to the other two of the total three antecedents that predict intention according to the Theory of Planned Behavior. In a follow-up study, the subjective norms, the experience of what an individual thinks other people expect of that person, and perceived behavioural control, the extent to which someone thinks they can perform the behaviour, could also be investigated. Ideally, the same group of respondents should be interviewed again within a certain period, for example in one year, to investigate whether they have realized their intention which resulted in certain behaviour. The advantage at that time is that the MaaS app Amaze will be live by then so that a comparison with the current baseline measurement could be made.

This is not the only thing to include in follow-up research. Several respondents stated that they were interested in ridesharing, although some employers tried this but which ultimately did not yield the desired result. In MaaS, ridesharing would be a welcome addition to complete the offer, so for further research of considerable value. The declaration of the journey was highlighted in the interviews, but because not many employees had experience with declaring shared mobility and the employers with processing the declarations, no significant results were obtained. With higher usage, the option to declare could be tested with the choice between business, commute, and private, for example. In follow-up research, particular attention could be paid to one of the various shared mobility options; such as the shared bicycle, shared car, shared e-scooter, but also, for example, on the valuation of shared taxi and the kick scooter when it is available in the Netherlands.

Other perspectives are, for example, examining the group within the research population that does not own the car. Do people live in Amsterdam and can everything be done by public transport or by bicycle? What could shared mobility offer them? This applies, for example, to expats who live and work in the Netherlands for a shorter period at a company in the Zuidas. Not only this group can be used for follow-up research, the companies they work for, mainly consultancy, are also an interesting sector. This is because the interviews also revealed that within the consultancy employees are at the customer from Monday to Thursday and only come to their own office on Friday. To what extent does the circumstance determine their travel behaviour? Traveling to other locations is in any case relevant for follow-up research because companies are often not only located in the Zuidas, but also at other locations in the country. They also want to travel there sustainably and partly with shared mobility. What options are there for this and how can employers best facilitate this transport?

Finally, virtually the main focus of the Discussion is that the interviews were conducted during a period when respondents were all required to work from home due to measures related to the spread of the COVID-19 virus. As a result, some answers could be different than normal because all interviews were conducted online instead of face-to-face. The respondents often mentioned that it concerned the "pre-corona" time. This reduces the validity of the research, while COVID-19 can be seen as a life changing moment so that could lead to changes in the mobility choices on medium term. In addition, at the time of writing it is unknown how long the situation will last and what consequences working from home will have on transport choice and overall mobility demand. On the other hand, this could also lead to a growth in the use of shared mobility.

8. Recommendations

Besides a contribution to the scientific literature, this research also contributes to the practical elaboration of MaaS. The development of Mobility as a Service (MaaS) offers many potential positive effects on current mobility problems. In urban areas, MaaS can ensure more efficient use of existing modes of transport and infrastructure and can thus lead to a reduction of congestion, more use of sustainable modes of transport, and thus fewer cars on the street. This contributes to improved accessibility and a higher quality of life in urban areas through an increase in the available public space and air quality. Based on the results and conclusion from this thesis, the following recommendations are formulated. The recommendations for further research can be found in the previous Discussion chapter.

For shared mobility services and MaaS providers such as Amaze and Radiuz, the factors that influence the intent of employees and employers are particularly important. Given these factors, it can be stated that when these concerns are adjusted or improved, it leads to a high or higher intention. Higher accessibility, an (even) easier user experience, and lower costs would increase the intention to use shared mobility. If shared mobility would be more sustainable, for example by offering only electric vehicles, and be more flexible, for example by offering more types of shared cars which increases freedom of choice, this will result in a higher intention and market opportunities for shared mobility services. Also, there is substantial demand for free-floating shared cars with national coverage. This so that the shared car can also only be used for single trips. In addition, there is a need for a specific location where shared mobility can be found and from where it can be easily used. This offers opportunities for the development of a mobility hub and could be used as a recommendation to the municipality to realize this concept. Finally, a shorter travel time compared to public transport would increase the intention of using shared mobility. Displaying the travel time with a shared car, shared bicycle, or shared e-scooter compared to public transport would, therefore, be promising.

When there are practical recommendations for MaaS providers, such as Radiuz and Amaze, an app for all forms of mobility can certainly count on interest among the respondents. Here you can see what is available as well as use and pay for it. Concerning payment, a clear display of the prices of both public transport compared to shared mobility would be highly appreciated. Another functionality that is promising for a MaaS app is the easy tracking of which mode of transport is being used. Ideally, this immediately reimburses the kilometres that the end-user cycles. This would not only be useful for bicycles but also when traveling by public transport so that you can easily check-in and out via the app with a QR-code without needing an OV chip card.

In addition to the mentioned price comparison, the travel advice would also like to value the fastest route, the most vital route, and the most sustainable route. It emerges that the sustainability aspect should not immediately predominate in an activation campaign, but that this should be more focused on convenience, costs, and travel time. However, a possible implementation of sustainability could be given shape by allocating "green leaves" to certain (chain) journeys of which the emissions are lower. These leaves can then be saved to unlock certain incentives, such as free use of a shared bike. This form of gamification could be seen as an important and unique factor for the use of the MaaS app.

Thinking along with the user and immediately indicating what is most convenient is a frequently heard wish. So that choices can be proposed based on the habits of the traveller, for example when traveling during rush hour. Then the metro is less appreciated, so the MaaS app could directly offer a shared bicycle. In the long run, this travel proposal is based on the pattern that the app recognizes, a proposal is made about the way back home or the expected mode of transport at that time. Here the MaaS app should be proactive and be able to send the user a notification. In addition, a balance on which bicycles, public transport, the car, and possibly shared mobility can be found could be added. In this way, the user can set how many days the bike wants to use and those will receive a notification.

One of the biggest current concerns among employers is limited insight into the employee's travel behaviour. MaaS could distinguish itself by offering this insight to the employer. In this way, the employer could monitor and control travel behaviour where necessary, preferably with a dashboard. That dashboard is based on the series of business travel transactions that the end-user can find in the app and for which feedback is provided from the back office and settlements.

All in all, the potential for a successful rollout of MaaS in the Zuidas is absolutely under discussion. In addition to motivating the employees present who are given access to all forms of mobility, employers will also benefit from the greater insight. With over 45,000 employees, the Zuidas as an office location is one of the flagships in the Netherlands. Because of sustainability, which plays an important role in the success of MaaS, the lease car may lose popularity if the entire mobility is facilitated so well. For example, future employees will prefer a mobility budget to a lease car, which reduces congestion and CO2 emissions. When the recommendations regarding travel preferences, functionalities, and in-app integration of as many mobility services as possible are met, employees could be tempted to change their travel behaviour and the potential positive effects of MaaS could be realized.

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