Opportunities and barriers of ride-sharing in work commuting – a case study in Sweden.

David Bauer
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# Contents

1. Introduction ................................................................................. 1  
   1.1. Background ........................................................................ 1  
   1.2. Problem ............................................................................. 2  
   1.3. Aim and Research Question .............................................. 2  
   1.4. Delimitations ..................................................................... 2  
   1.5. Outline ............................................................................. 3  

2. Literature review and conceptual framework .................................. 4  
   2.1. Dynamic ride-sharing .......................................................... 4  
      2.1.1. Definition .................................................................... 4  
      2.1.2. Advantages of ride-sharing .......................................... 4  
      2.1.3. History ....................................................................... 5  
   2.2. Previous studies ................................................................... 5  
   2.3. Ride-sharing applications ................................................... 6  
   2.4. Social Practice Theory ........................................................ 7  

3. Methodology ............................................................................... 10  
   3.1. Research design ................................................................... 10  
   3.2. Literature review ............................................................... 11  
   3.3. Case study ......................................................................... 11  
      3.3.1. Choice of case and theoretical framework .................... 12  
      3.3.2. Data collection ............................................................ 12  
      3.3.3. Quality assurance ....................................................... 13  
   3.4. Ethical considerations ......................................................... 14  
   3.5. Data analysis ...................................................................... 15  
   3.6. Limitations ........................................................................ 15  

4. Empirical Background and context ................................................. 16  
   4.1. The traffic situation at Scania ............................................. 16  
   4.2. The mobile application ....................................................... 17  

5. Empirical Results ....................................................................... 19  
   5.1. First quantitative survey ..................................................... 19  
   5.2. Second quantitative survey ............................................... 23  
   5.3. Qualitative survey .............................................................. 25  
      5.3.1. Current way of commuting ......................................... 25  
      5.3.2. Experience of ride-sharing ......................................... 26  
      5.3.3. Perception of ride-sharing .......................................... 27  
      5.3.4. Perceived negative aspects of ride-sharing .................. 27  
      5.3.5. Environmental awareness .......................................... 28  

6. Analysis .................................................................................... 30  
   6.1. Applying SPT ...................................................................... 30  
      6.1.1. Materials ..................................................................... 30
6.1.2. Meanings ........................................................................................................ 31
6.1.3. Competences ................................................................................................ 32
6.2. Interconnections ............................................................................................... 32

7. **Discussion** ........................................................................................................ 33

7.1. What insights can social practice theory provide about ride-sharing for commuting travel? 33

7.2. Methodological reflections ................................................................................. 34

8. **Conclusion and further research** ...................................................................... 35

9. **Acknowledgement** .......................................................................................... 36

10. **References** ...................................................................................................... 37

Appendix 1. Research Protocol .............................................................................. 44
Appendix 2. First quantitative survey ...................................................................... 45
Appendix 3. Second quantitative survey .................................................................. 48
Appendix 4. Interview guide .................................................................................... 50
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DAVID BAUER


Abstract:

The world faces human-made hazardous weather events such as heat waves, droughts, floods and wildfires in dimensions which have never been seen before. A crucial contributor to this negative trend is the constantly growing transportation sector. In addition, most urban regions suffer from traffic congestion which lead among others to local emissions, the loss of time and noise pollution. One promising approach to reduce the amount of transport related emissions is ride-sharing. This paper focuses on the possibilities and barriers of ride-sharing for the daily commute to and from work. To gain reliably results, a real-life test trial was implemented at a Swedish corporation. The gathered quantitative and qualitative datasets were analysed with the framework of Social Practice Theory, which splits up the practice into its three elements of materials, meanings and competences and thereby develops revealing insights. The reason for the low participation rate during the test trial can be traced back to the potential loss of flexibility. Despite a high environmental awareness and a deep trust relation to colleagues, the potential loss of flexibility was for most participants the crucial factor to not start ride-sharing. Even though individuals’ opinions were very positive towards the idea of ride-sharing, the participation rate during the real-life study shows that the perception of ride-sharing highly derivates from the action.

Keywords: Sustainable Development, Social Practice Theory, emissions, ride-sharing, mobile application

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Summary:
The world faces human-made hazardous weather events such as heat waves, droughts, floods and wildfires in dimensions which have never been seen before. A crucial contributor to this negative trend is the constantly growing transportation sector. Nearly a quarter of the global energy related CO₂ emissions can be traced back to transportation. In addition, most urban regions suffer from traffic congestions which lead among others to local emissions, the loss of time and noise pollution.

The concept of ride-sharing, i.e. users share their ride when their trips match each other in time and place, is one approach to reduce the number of cars and thereby the negative transportation related effects. In addition, there are benefits for the individual user, as fuel, tolls and vehicle costs are shared. Previous studies, in which simulations based on real travel data are performed, have shown that by ride-sharing, the number of cars and the kilometres travelled can be significantly reduced. Even if there are already several ride-sharing services on the market, ride-sharing is still no widely-accepted mean of transportation. Research to investigate user behaviour and acceptance of ride-sharing is still limited, especially testing the acceptance of ride-sharing in real-life settings.

This work attempts to gain new knowledge about the possibilities and barriers of ride-sharing by considering a case study with real-life settings and analysing the acceptance by using a framework of social practice. The case study focuses on the daily commute to and from larger enterprises, in particular an enterprise with 12.000 employees located in the south of Stockholm.

The daily commute to and from work has high potential for ride-sharing due to two reasons. Firstly, the work commute is a reoccurring trip with high chances of overlapping routes due to similar destinations (from home to work) and secondly, the trust barrier might be reduced due to sharing the ride with co-workers only.

In the case study, 451 employees living in the same area south of Stockholm, have been invited to participate in a test trial and use a company internal ride-sharing mobile application. As a motivation, 10 dedicated parking spots were reserved for the users of the ride-sharing service. To collect data, two quantitative surveys were conducted, one before and one three weeks later, after the test trial. In addition, several qualitative semi-structured interviews were performed.

The results show that despite participants’ high environmental awareness, the usage of the ride-sharing application was very limited, in fact, only 5% of all participants downloaded the application. Even if the trust and security concern among co-workers was very low, the loss of flexibility was the main reason for the low number of participants. Although the experienced lack of flexibility is a barrier to overcome, work commuting is a promising application for ride-sharing. Even though individuals’ opinions were very positive towards the idea of ride-sharing, the participation rate during the real-life study shows that the perception of ride-sharing highly derives from the action.

Keywords: Sustainable Development, Social Practice Theory, emissions, ride-sharing, mobile application

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List of figures and tables

Fig. 1.: Three-element Social Practice Framework (Shove, et al., 2012) ................................................................. 8
Fig. 2.: Classification mixed methods research in terms of priority and sequence ......................................................... 10
Fig. 3.: Timeline of test trial and data collection ........................................................................................................ 12
Fig. 4.: Bird’s eye view of STC in Södertälje (Source: Google Maps, before 2017, ‘red circle’ added by author) 16
Fig. 5.: Screenshots of Catchy-Ride application: (from left to right) home-screen; offering a ride; searching a ride; detailed ride information ........................................................................................................ 17
Fig. 6.: Parking sign for Catchy-Ride users only. (Designed by application developer) ...................................................... 18
Fig. 7.: Distribution of participants’ ages (1st survey) ........................................................................................................ 19
Fig. 8.: Participants’ mean of transportation .................................................................................................................. 19
Fig. 9.: Satisfaction of current commuting situation (Likert scale) ................................................................................ 20
Fig. 10.: Distribution of reasons for ride-sharing. (Likert scale) ................................................................................... 21
Fig. 11.: Distribution of openness towards ride-sharing from a driver’s and a passenger’s perspective. (Likert scale) ................................................................................................................................. 22
Fig. 12.: Distribution of participants’ ages. (2nd Survey) ............................................................................................... 23
Fig. 13.: Participants’ opinion regarding main problems of ride-sharing. (Likert scale) .................................................. 24
Fig. 14.: Participants’ reflection on the environmental impact of their commuting habits. (Likert scale) ...................... 25
Fig. 15.: Summary of findings presented with the frame of SPT .................................................................................... 30

Table 1.: Interview participants .................................................................................................................................. 13
Table 2.: Techniques to ensure validity and reliability in case studies. (Based on Riege (2003; p.78-79); modified and applied on project by author) .......................................................................................... 14

Abbreviations

GHG – Greenhouse gases
CO₂ – carbon dioxide
SPT – Social practice theory
HOV – High occupancy vehicle
R&D – Research and development
CV – Commercial vehicles
AB – Aktiebolaget
SJE – Scania Job Express
SP – Social practice
e.g. – exempli gratia (for example)
1. Introduction

The world faces human-made hazardous weather events such as heat waves, droughts, floods and wildfires in dimensions which have never been seen before (Sims, et al., 2014). The Stockholm resilience centre stated that, in addition to biosphere integrity, land-system change and biogeochemical flows, climate change is the fourth control variable to cross its planetary boundary (Steffen, et al., 2015). The increasing concentration of various greenhouse gases (GHG) in the atmosphere, which has more than doubled since 1970, is one of the main contributors to climate change (Sims, et al., 2014). With a global share of 65% of all GHGs, carbon dioxide (CO₂) is claimed to be a principle source of global warming (Victor, et al., 2014). Nearly a quarter (23%) of the global energy-related CO₂ emissions in 2011 can be traced back to the transport sector (Sims, et al., 2014). To address the negative development, countries try to implement the 2030 Agenda for Sustainable Development and its 17 sustainable development goals introduced by the United Nations during the 21st Conference of the Parties in Paris 2015 (UN, 2016). Even if sustainable transport is not represented by a separate SDG it still plays a major role in achieving sustainability (Lundstedt & Tohá, 2016). Ban Ki-moon (2016) states that sustainable transport does not only support social goals such as job creation, poverty reduction, access to markets and empowerment of women, it is also essential to reduce climate change and air pollution (ibid.).

1.1. Background

The current main strategies for reducing transport-related CO₂ emissions are mostly technical solutions. Examples are the increase of energy efficiency and the shift from fossil fuels to environmental friendly energy sources such as biofuels, hydrogen and electricity. Meyer et al. (2012) claims that technical solutions cannot pave the way to sustainable transport alone, it is also necessary to disconnect mobility from private travel modes towards shared travel solutions such as public transportation and car- or ride-sharing. Different “hard” measure policies, with the aim to reduce the amount of traffic, such as road taxation, showed a certain success in small areas (Eliasson, 2014), however they could not achieve a satisfactory decrease in car-use. Stockholm for example introduced congestion charges in August 2007 (Vägverket, 2007). However, the exclusive charging system did not reduce the amount of traffic as expected (Börjesson & Kristoffersson, 2017). A world-wide ranking of congestions level in 2016 still graded Stockholm on number 92 out of 189 with additional 61% of travel time during the evening peak compared to a free-flow situation (Traffic Index, 2017). While “hard” measures, such as increased costs, prohibiting or rationing of car use are not alone sufficient in reducing car-use (Stopher, 2004), “soft” measures, for instance information distribution and persuading car users to voluntarily switch to sustainable travel modes, attract increasing attention (Taylor, 2007; Gärling & Satoshi, 2009; Bamber et al., 2011) and prove efficiency (Brög, 2009; Cairns, 2008).

Even if ‘hard’ and ‘soft’ measures achieve positive results, the global traffic situation is still far from being solved which encouraged many researchers to analyse the potential travel mode shift with alternative theoretical approaches (Schwanen, et al., 2012). Those approaches mainly concern individualist behaviour change and are largely based on social psychological research (ibid.). According to Spotswood et al. (2015), most common theories are the Theory of Planned Behaviour (Ajzen, 1991) and the Theory of Interpersonal Behaviour (Triandis, 1977). Research studies using these theories have been widely criticized especially for the assumption that individuals are mainly responsible for the traffic problems while opponents see society as the main problem (Spotswood, et al., 2015). In this work, Shove et al.’s (2012) definition of Social Practice Theory (SPT) will be applied to analyse the practice of an alternative travel mode itself instead of studying individual’s travel behaviour. The specific travel mode, researched in this work, concerns a joint mode of transportation where people share their trip with individuals, who have the same destination. The research will focus on the daily recurring commute to and from work of large enterprises, in particular a vehicle manufacturing enterprise with 12.000 employees located south of Stockholm.
1.2. Problem

Despite numerous extensive research studies regarding travel behaviour change, there is still a lack of promising approaches to effectively change peoples’ transportation mean towards sustainable solutions (Chowdhury & Ceder, 2016). By using SPT to analyse the process of ride-sharing for commuting travel, this work will contribute to address the problem of single occupancy driving. The attempt of analysing specifically the practice of ride-sharing with the conceptual framework of SPT has, to the author’s knowledge, not been done before. Existing literature regarding ride-sharing has far focused on testing and researching the operational aspects of shared trips instead of attempting to understand psychological and policy aspects (ibid.; Teubner & Flath, 2015). Furthermore, there hardly exists any research which tested a ride-sharing application in real life conditions (see Literature review, 2.2). By testing a ride-sharing application for commuter travel in real-life circumstances and analysing the results using SPT, this work views ride-sharing from a new perspective and thereby aims to gain new insights and close the gap in literature. It is also an attempt to get one step closer to solve one of the biggest challenges of our time, which is according to Johnson (2013), consumer behaviour change.

1.3. Aim and Research Question

The aim of this research is to identify what insights social practice theory can provide about ride-sharing for commuting travel, by studying the case of Scania employees in Södertälje, Sweden. It furthermore aims at using the results to provide suggestions to make ride-sharing an attractive mode of transportation.

To achieve the aim, the following research question has been formulated:

What insights can social practice theory provide about ride-sharing for commuting travel?

The project includes a case study in which employees from Scania CV AB in Södertälje were encouraged to participate in a ride-sharing pilot project. Conducting the test-trial with employees working for the same company has two advantages. First, people have similar travel patterns: ‘home to work’ in the morning and ‘work to home’ in the evening and second, people are colleagues and thus no strangers. According to the study of Chaube et al. (2010) these two requirements are important to make dynamic ride-sharing work.

1.4. Delimitations

The case of this project work focuses on the commuting habits of employees from Scania CV AB in Södertälje, Sweden. By introducing the process of ride-sharing to 451 employees, they get the opportunity to voluntarily change their way of commuting towards a shared and therefore a more environmental friendly mean of transportation. At no time during this work people were forced to change their behaviour, however it could be assumed that the overall conditions for adapting to an environmental friendly mean of transportation are rather high due to Scania’s main strategy of reducing transport related CO2 emissions (Scania, 2016). Furthermore, Sweden is a country in which environmental protection attracts huge attention not only in politics but also in communities and residents (Swedish Institute, 2016). Since those circumstances might influence participants’ perception or behaviour it would be interesting to conduct a similar study in a country with different conditions (e.g. no political support for environmental work or little public awareness of environmental concerns).

The collected empirical data is structured with the theoretical framework of SPT, which limits the way of analysing, however there are good reasons for using SPT. The most important reason is the fact that ride-sharing, to the authors knowledge, has not been analysed with the framework of SP before even if various studies, using SPT to research e.g. sustainable commuting with bikes (Spotswood, et al., 2015) or busses (Cass & Faulconbridge, 2016) showed substantial results. This new approach will subdivide ride-sharing into various parts and thereby view it from different perspectives which helps to contribute
to already existing research studies. Previous behaviour change studies most commonly used Ajzen’s (1991) Theory of Planned Behaviour (Chowdhury & Ceder, 2016).

1.5. Outline

This thesis starts with an introduction (Chapter 1), which presents the background and describes the study problem, followed by the aim of this study as well as the research question. Chapter two first provides a definition of the term ride-sharing, followed by the literature review, which consists of previous ride-sharing studies and similar concepts of ride-sharing applications. The last part in this chapter explains the theory of social practice which serves as the conceptual framework of this study. The methodology section (Chapter 3) starts by presenting the research design and continues by motivating the case study approach. The chapter continues by highlighting the different data collection approaches during which a special focus was put on quality assurance and ethical considerations. Limitations which decide the study’s scope are pointed out in the end of this chapter. The empirical background which consists of the current traffic situation at Scania CV AB and the functionality of the mobile application are disclosed in chapter four. Chapter five reveals the empirical results from two quantitative questionnaires and several qualitative semi-structured interviews. Using the framework of SPT, chapter six provides an analysis of the empirical results. Next to last, chapter seven discusses the findings and provides approaches to solve the problem. In addition, the conceptual framework and the data collection are reviewed critically. The last chapter concludes the study and provides examples for further research.
2. Literature review and conceptual framework

The literature review is conducted to develop a multidisciplinary perspective on similar applications and previous studies. The chapter begins with defining the practice of ride-sharing, followed by presenting a selection of previous studies. Subsequently, several related international ride-sharing applications are summarized. The chapter ends by explaining the theory of social practice which serves as the conceptual framework.

The growing concern about climate change in combination with technical achievements are two main contributors why “Collaborative consumption” or “sharing economy” (The peer-to-peer-based activity of obtaining, giving, or sharing the access to goods and services, coordinated through community-based online services) became an appealing alternative for consumers (Hamari, et al., 2016, p. 2047). Especially during the last decade, it turned out how far-reaching the sharing economy has become. An increasing number of start-ups, addressing the different sectors of collaborative consumption like accommodation (Airbnb, Couchsurfing), handicraft (TaskRabbit), clothing (GirlMeetsDress), spare parking space (Justpark) and many more, enable easy access to shared products and services. This study work focuses on different approaches concerning shared mobility systems, in particular ride-sharing.

2.1. Dynamic ride-sharing

2.1.1. Definition

The term ‘ride-sharing’ or ‘dynamic ride-sharing’ has been interpreted and defined in several different ways over the last decades. An early definition has been given by the State of Virginia in the United States: “Ridesharing arrangement means the transportation of persons in a motor vehicle when such transportation is incidental to the principal purpose of the driver, which is to reach a destination and not to transport person for profit. [...]” (Code of Virginia, 1989, §46.2-1400). A similar definition is given by Furuhata, et al. (2013) in which ride-sharing refers to a smart mean of transportation in which individual travellers share a vehicle with others who have the same destination, while splitting journey-related costs such as gas, tolls or parking fees. A slightly different concept of ‘ride-sharing’ is used by Cohen & Kietzmann (2014, p. 285) who define the financial model of ride-sharing as “Drivers earn extra money while intermediaries earn up to 20% of each transaction.”. This definition deviates from the two mentioned above since not only the driver but also intermediaries earn a share of the sum. In this work, ride-sharing is used according to the definition of the State of Virginia since the main goal is to reduce the number of cars instead of gaining financial profits.

Furthermore, it is important to distinguish ride-sharing from similar shared transportation means such as car-sharing or carpooling. While the aim of ride-sharing is to share a ride, the purpose of car-sharing is to share a car with different users, similar to carpooling where an individual gets access to a pool of cars for hourly or daily use (Agatz, et al., 2012; IEA, 2005). The term dynamic ride-sharing, also known as real-time ride-sharing, ad-hoc ride-sharing or instant ride-sharing, merely adds the real matching time between driver and passenger (Gargiulo, et al., 2015). The wide distribution of smart phones during the last decade gave dynamic ride-sharing a significant boost. With algorithms, it is possible to provide the best real-time match between driver and passenger in terms of time and location. A big number of studies focused on the topic of algorithms of which some are Kleiner et al. (2011); Cici et al. (2013); Bicocchi & Mamei (2014); Schreieck et al. (2016) and Stiglic et al. (2016).

2.1.2. Advantages of ride-sharing

The sharing community has several social, environmental and economic advantages (Hamari, et al., 2016), however, the main reasons to introduce ride-sharing is based on the desire to reduce:

- the amount of traffic, fuel consumption and emissions (IEA, 2005);
- the need for parking spaces (Merat, et al., 2016);
• traveling costs and commuting time (Agatz, et al., 2012).

Furthermore, ride-sharing is considered to provide an attractive alternative to public transport and improves social interactions (ibid.). In this work specifically, besides reducing the environmental impact of participants, ride-sharing is hoped to decrease the daily traffic congestions as well as to ease the complex parking situation at Scania CV AB in Södertälje.

2.1.3. History

The first organized ride-sharing was introduced by the U.S. government during WWII with the aim to conserve fuel and rubber resources. The so-called Car-Sharing Clubs were managed with bulletin boards at local matching institutions (Furuhata, et al., 2013). The second time in history when ride-sharing gained attention was in the 1970s during the oil crises. This was also the time when the U.S. first introduced high occupancy vehicle (HOV) lanes which were lanes, dedicated for two or more travellers per car only (Amey, 2010). However, due to low oil prices and strong economy growth, the participation in ride-sharing decreased radically in the beginning of the 1980s (ibid.). The rapid rise in oil prices since 2005 in combination with the global financial crisis in 2008 created a renewed interest in ride-sharing. The advent of the smartphones, which are permanently connected to the internet, enabled start-ups to develop applications which link drivers and passengers immediately. The potential increase in flexibility provided by modern information technology made ride-sharing more attractive than ever before. Nowadays numerous different ride-sharing providers exist in many countries around the world.

2.2. Previous studies

Many studies have shown, that ride-sharing has several advantages not only for the user but also for cities, municipalities, and companies (Chan & Shaheen, 2012). Besides reducing CO₂ emissions and fuel consumption (Jacobson & King, 2009), it also saves the users’ money and time (Teubner & Flath, 2015). A detailed analysis about the environmental benefits of ride-sharing in terms of reduced emissions and vehicle kilometres travelled is demonstrated by Caulfield, (2009). In addition, several studies have theoretically proven, that ride-sharing is a working mobility system. Bicocchi & Mamei (2014) for example developed a recommender system – integrated in smart phones, tablets and in-vehicle platforms – to analyse mobile data and identify overlapping routes, feasible for ride-sharing. The data was collected over a period of one month and included 1.000 persons living in the same city. The study’s result was that more than 60% of all trips could be saved, if the driver was willing to drive a detour up to 2000 metres and if all users participate in their sharing system. A study with similar results from Stiglic, et al. (2016) demonstrates the impact of user flexibility on the performance of a ride-sharing system. The computational study shows that participants flexibility in terms of departure and arrival times, as well as drivers acceptance to drive a detour, play key roles in easing the matching process (ibid.). To match drivers and riders in a dynamic setting is the purpose of the study from Agatz et al., (2011). With a simulation study, based on travel demand data from metropolitan Atlanta, Agatz et al. developed optimization-based approaches which aimed at minimizing travel miles and travel costs. The researcher found out that sophisticated optimization methods increase the likelihood of ride-share matches and reduce travel costs (ibid.). The work from Cici et al., (2013) covers a similar topic as Bicocchi & Mamei (2014). The researcher use Call Descriptive Records from the city of Madrid to determine if mobility patterns and city layouts exhibit enough route overlap to make ride-sharing work. The research of Cici et al. (2013), which mainly focuses on people having neighbouring home and work locations, identified that even a rather short detour of 0.6 kilometres reduces the number of cars by 52%. This number can even be reduced by up to 67%, if additional passengers are picked up along the way and if any commuter would share a ride with any other as long as their routes overlapped (ibid.). Even if a collective taxi ride is not the original model of a shared ride system it is still related. Instead of sharing the emerging costs for petrol or tolls with the picked-up passenger, the costs for the taxi ride can be divided between the passenger who called the taxi and the passenger who was picked up on the way. Shmueli et al., (2015) studies the potential benefit of ride sharing by analysing a dataset of over 14 million taxi trips in New York. According to Shmueli et al. more than 70% of the taxi rides can be shared.
if the passengers can wait for 30 minutes or more (ibid.). Another study, focusing on the feasibility of ride-sharing systems, is the work from Stiglic et al., (2015) who investigates the benefits of meeting points. Like the studies mentioned above, Stiglic et al. performs an extensive simulation study to analyse the benefits of passengers’ flexibility in a ride-sharing system. The results of this study, like several previous studies, show that the number of matches rises significantly with increasing passengers’ flexibility (ibid.).

The research mentioned above has shown that ride-sharing does not only lead to environmental, social and monetary benefits, it has also theoretically high potential and feasibility. Keeping this in mind, the question arises why ride-sharing is still not a widely-accepted mean of transportation.

Most research investigates and analyses feasible algorithms to match driver and passenger (Bicocchi & Mamei, 2014; Agatz et al., 2011; Cici et al., 2013; Stiglic et al., 2015), user-friendliness (Gargiulo et al., 2015; Xu et al., 2015; Kleiner et al., 2011), different payment methods (Kleiner et al., 2011) and environmental benefits (Jacobson & King, 2009; Caulfield, 2009). Chowdhury & Ceder, (2016) conducted a literature review regarding studies focusing on factors influencing commuters’ willingness to public transportation. The authors revealed that the main research focus applies to the operational aspect, while the number of research concerning the psychological aspect, such as motivations and incentives to raise the willingness of commuters to share rides, is lacking behind (ibid).

One possible solution to gain users’ trust and fulfil their expectations is to create a user-centred service design approach. Such a user-centred service design of an experimental dynamic ride-sharing system was the main goal of a study from Gargiulo et al., (2015). Their service, a mobile application called VirtualBus which allows users to get arrangements in real time for sharing car rides, was designed, prototyped and tested involving users during every step to ensure user-friendliness from day one (ibid.). An online questionnaire among 500 participants highlighted that trust has a significant importance, not only among users but also regarding data collection through the mobile application. Respondents wished to be able to give feedback to other users (86%), find trusted driver (80%) and to be sure to get the right reimbursement before the matching occurs (84%) (ibid.). In accordance with the findings from Gargiulo et al., (2015), security concerns were defined as one of the main barriers to real-time ridesharing by several other researchers. (Ghoseiri et al., 2011; Cici et al., 2013).

The work at hand attempts to contribute to close the literature gap by conducting a real-life test trial with potential users to exemplify how many participants are willing to change from single occupancy driving to a ride-sharing solution.

2.3. Ride-sharing applications

Today, many ride-sharing mobile applications are available in several countries around the world. To address the security concern, identified by various researchers, many different approaches on how to reduce the risk of incidents and increase the trust between driver and passenger were developed. While most companies give the opportunity to create a detailed profile combined with the option of rating the driver and the passenger, other providers connect their application to social media platforms such as Facebook or Twitter, to ensure rides with your friends or your friends’ friends only (www.hitcharide.me). The Turkish ride-sharing company ‘Volt’ offers a mobile application, which addresses several safety concerns. To ensure very high safety standards for the rider and the passenger, every user must verify their Phone, Credit card and ID number. Furthermore, they offer a community service for companies or universities like ‘Zimride’ and ‘TwoGo’. With the aim of maximum safety standards, they collaborate with an external company which uses GPS data to analyse the driver’s driving behaviours. This data is converted and added to the driver’s ranking (www.thevoltapp.com). The American ride-sharing provider ‘Zimride’ and the German equivalent ‘TwoGo’ stroke a new path by developing a mobile application tailored for companies and universities. Both providers use the internal network to get access to the mobile application (www.zimride.com; www.twogo.com). This concept, compared to the ones mentioned before, combines two main advantages. First, the destination (company or university) is the same for every user of this specific network and second, security concerns are limited since the person one will share a ride with is no total stranger but rather a college or a fellow student.
It is a challenge for every ride-sharing provider to attain and keep the “critical mass”, i.e., the number of trip announcements at which a ride-sharing system becomes sustainable. Most ride-sharing providers try to attract customers by solely listing the benefits such as money saving, CO₂ reduction and creating social contacts. The Asian company called ‘Ryde’ claims besides splitting costs, making friends and reducing congestion that sharing your ride is even a way of making business contacts (www.rydesharing.com). Individual ride-sharing providers came up with various ideas to increase the number of users. The American company called ‘NuRide’ for example, attract customers by handing out rewards for so called greener trips. The mobile application shows the money you have saved as well as the emissions you have prevented by joining a green trip instead of driving alone in your private car. Those numbers will be transformed to points which can be redeemed for restaurant coupons, retailer discounts or tickets to shows and attractions. (www.nuride.com) A similar approach was chosen by the French company ‘Hupp’, the Israeli company ‘La’Zooz’ and the Turkish company ‘Volt’. Points earned with those ride-sharing providers can be redeemed at local businesses. (www.gethupp.com, www.lazooz.net, www.thevoltapp.com)

2.4. Social Practice Theory

During the last 40 years, several researchers attempted to understand and influence human behaviour to direct it towards more sustainable actions (Jackson, 2005). This development created numerous social science theories which address the relation between human actions and social order and thus try to explain human behaviour. Originally, those diverse theories emerged from two classical terms: 'homo economicus' and 'homo sociologicus' (Reckwitz, 2002). The former describes actions by having options to individual purposes, intentions and interests. In this case, social order is created and influenced by the combination of single individuals’ interests. The latter model however explains human actions by referring to collective norms and values; social order is then created through a normative consensus (ibid.). Researcher realized that these general explanations of social life is not enough to deliver the right answers, which lead to an approach where neither individuals nor structures were ignored (Schatzki, et al., 2001). This idea lead to practice theory which roots, according to Reckwitz (2002), can be traced back to the authors Giddens (1938-), Lyotard (1924-1998) and Bourdieu (1930-2002).

Spotswood, et al. (2015) explains the variances between traditional individualist models of human behaviour and theories of practice by pointing out the theories’ different objects of analysis. The traditional individualist models focus on personal intentions and subjective interests, however the theories of practice approach does not focus on the “experience of the individual actor, nor the existence of any form of societal totality” (Giddens, 1984, p. 2). Social practice solely considers the practice itself which is performed by the single individual or collective individuals, who act as ‘carriers’ of the practice (Reckwitz, 2002; Hargreaves, 2011). Using football as an example, social practice does neither focus on the individual who performs the game nor the social structures which surround it but rather on the practice of playing football itself, and as such links them together. Reckwitz (2002) defines the practice as a routinized behaviour, consisting of numerous interdependent elements. Those elements are “forms of bodily activities, forms of mental activities, ‘things’ and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge” (Reckwitz, 2002, p. 249). Besides Reckwitz’s detailed description of interdependent elements, various other configurations were created over time (Schatzki, 1996; Warde, 2005; Southerton, 2013). However, this work will use Shove et al.’s (2012) model (Fig. 1.), which is a simplified deviation from Reckwitz’s detailed description of interdependent elements. According to Spotswood et al. (2015, p. 24), the ‘three element model’ is the most fitting model for behaviour change purposes due to “its relatively parsimonious approach”.

Shove et al.’s (2012) model is based on three interconnected elements that are necessary for any practice to exist. Those elements are materials, competences and meanings.

- ‘Materials’, as Shove et al. (2012) describe it, includes for example things, hardware, encompassing objects and the body itself. Using the example of football, materials would be the ball, goals or the pitch. By changing or creating materials, different practices are modified, sustained or
developed (Spurling, et al., 2013). It is important to ensure, while for example transforming an already existing practice into a more sustainable option, that all necessary components or infrastructures are in place and accessible (Peattie & Peattie, 2009).

- ‘Meanings’, are described by Reckwitz (2002) as ‘mental activities, emotions and motivational knowledge’ (p. 249). Shove, et al. (2012) sees meaning as ‘unconscious forms of knowledge and experience through which shared ways of understanding and being in the world are established’ (p.12). In the example of football, this element could be described as the diverse conception of football in different countries regarding publicity and gender. It furthermore refers to the social significance to participate at a practice at any time (Balke, et al., n.a.). A sustainable lifestyle for example is in most parts of the world seen as a desirable way of living, however being concerned about environmental impacts does not automatically lead to a behaviour change towards a more sustainable way of living.

- ‘Competence’ is described as ‘multiple forms of understanding and knowledgeability’ (Shove et al., 2012, p. 23). Shove et al. (2012) also refer to skills, know-how and techniques. In the sense of football, it could be defined as the ability to kick a ball, triple with the ball or know the rules of the game. Without the relevant know-how, it is not possible to perform or sustain a practice. Thus, it is essential that sufficient information is provided for participants to conduct a new practice. This information does not only focus on how to perform a practice but also on background knowledge such as ‘why it makes sense to perform a practice’ or ‘what is the possible outcome of a practice’.

Figure 1 shows Shoves et al.’s (2012) model of SPT which will be used as a conceptual framework during this study.

The three categories of elements, are not self-standing, but strongly connected with each other. The connections between the elements are even more important than the elements themselves and decide if practices are created, sustained or destroyed (Spotswood, et al., 2015) Detecting and analysing the links between different bundles of practices or even within practices can create a web of interrelated factors, which can serve as a basis for an extensive behaviour change strategy (ibid.). In addition, every change in one bundle of practice is likely to affect another bundle. Knowing how different practices affect each other is fundamental for any behaviour change strategy. Pro-environmental practices such as using sustainable means of transportation, is not achieved by educating individuals about the environmental benefits nor by persuading them to review their way of commuting, but instead convert practices to
make them more sustainable and thereby increase participants’ adaptation. Warde (2005) states that ‘the principal implication of a theory of practice is that the source of changed behaviour lie in the development of practices themselves’. Furthermore, SPT allows researchers and practitioners to avoid criticisms or so called ‘victim blaming’. It avoids this by defining practices as something abstract instead of seeing individuals as ‘responsible’ for their behaviour (Hargreaves, 2011; Shove et al., 2012).

According to Cass & Faulconbridge (2016), individuals’ decision to use a specific type of transportation depends on having access to transport related materials, having adopted sufficient competences and understanding the societally valued meanings. The combination of those three elements develops and establishes a practice. Many practices naturally change over time; however, some scientists try to actively induce a change, most commonly towards a more sustainable practice (Spurling, et al., 2013). The main idea in changing behaviour is to develop the desired practice in a more convenient and eligible way than the practice which already exists. To reach this goal, the framework of SPT solely focuses on the practice as a phenomenon of enquiry rather than individuals’ motivations or barriers to participation (Spotswood, et al., 2015, p. 29). This enables the researcher to view a practice from an outlying perspective which helps to identify the key obstacles. Subsequently those key obstacles could be changed or adjusted to make the practice more attractive.
3. Methodology

This chapter presents the methodological approach which consists of a mixed research method. Besides two questionnaires, conducted with several participants, 16 individuals were interviewed. The choice of the case study is presented while a special focus is put on quality assurance and ethical considerations. Limitations which decide the study’s scope are pointed out in the end of this chapter.

3.1. Research design

This project uses a real-life setting rather than an experimental approach to answer the research questions. Researching in real-life settings usually implies that structured and organized ‘phases’ are not feasible due to permanently changing circumstances to which a researcher must be able to react to (Bryman, 2016). Dubois and Gadde (2002, p.553) therefore suggest an “approach based on ‘systematic combining’ grounded in an ‘abductive’ logic”. The approach of ‘systematic combining’ enables the researcher to permanently go ‘back and forth’ in between different kinds of research activities which can lead to a wider understanding of theory and empirical phenomena (ibid.). Yin (1994) states that applying several different sources, while shifting between analysis and interpretation, generally leads to triangulation, which increases the credibility and validity of the results. The results of the data collection, meaning quantitative and qualitative surveys, is analysed with the framework of SPT and its three categories of elements of material, competence and meaning. To address the research question, this study uses an abductive approach consisting of case study and literature review. While the case study approach is explained in this chapter, the literature review will follow in chapter 3.2.

Mixed methods research enables several ways of classification. One approach is to organize the different methods regarding priority and sequence (Morgan, 1998b).

The priority decision determines if the qualitative or the quantitative method is the main tool of gathering data. A further possibility is that both methods have equal weights.

The sequence decision determines the chronological order of different methods. In other words, which method is used first, which second. It is also possible that both methods are used concurrently.

With this classification system presented in figure 2, nine different options are possible. The capital letters (e.g. QUAL) indicate the priority while the arrows (e.g. >) indicate the chronological order. The + simply stands for the concurrent use of both methods. In this survey, a quantitative questionnaire is conducted first, followed by qualitative semi-structured interviews while the principal data-gathering tools are the qualitative interviews. The red box indicates how data was collected in this study, using mixed methods research.

It is known that quantitative research is more common for studying peoples’ behaviour while qualitative research emphasises the meaning of actions (Bryman, 2016). However, mixed methods

![Fig. 2: Classification mixed methods research in terms of priority and sequence](image-url)
The importance of a detailed literature review including multiple sources is outlined by Yin (1994). Yin claims that any conclusion in a case study will be “much more convincing and accurate if it is based on several different sources of information following a corroborative mode.” (p.92).

Reviewing literature in the research field is essential to develop insights and deep understanding regarding the studied case (Yin, 2013). Besides proposing theoretical and conceptual frameworks, literature can explain important variables and their connections as well as help the researcher to interpret outcomes (Dubois & Gadde, 2002). Furthermore, conducting a thorough literature review will lead to research gaps and thus help to generate research questions (Robson, 2011).

To guarantee a thorough understanding of the studied field, a multitude of interdisciplinary literature is reviewed. The main topics consider past and present ride-sharing approaches as well as voluntary behaviour change literature, social-practice theory and research techniques. Most literature was found using databases such as the Uppsala University’s internal library (Uppsala universitetsbibliotek) and Google Scholar. To ensure a high quality of data collection, the literature search primarily focused on the latest studies and peer-reviewed papers.

3.3. Case study

A case study could be determined as a fitting method if the following three conditions are fulfilled. 1) the research question refers mainly to a ‘how’ or ‘why’ question, 2) no control of behavioural events is required and 3) the focus lies on contemporary events (Yin, 2009). However, the boundaries between different methods are not always sharp, but rather fluent with large overlaps (ibid.). Even if the research question of this study starts with ‘what’, the use of a case study as a research method is still justified, since the investigated individuals are not pushed to change their behaviour and the focus lies on a contemporary event (Yin, 2009). In addition, Bhattacharjee (2012, p. 94) claims that the case study is compatible for researching ‘complex organizational processes that involve multiple participants’, which additionally confirms the case study as a method of choice.

The weaknesses of the case study method are the individual, and therefore different interpretation of findings, the lack of control, and the generalization of results from one case site to other case sites (Bhattacharjee, 2012). Furthermore, it is essential to choose the right framework (Dubois & Gadde, 2002) and to avoid subjective biases (Yin, 2009). To avoid discussions about possible biases during the...
case study, Yin (2009) suggests using a case study protocol as well as to develop a case study database. The study’s procedures should be documented in a way which allows other researchers (or oneself) to repeat them (ibid.). By respecting those steps reliability problems will be minimized and the credibility of the results will not be impeached. How this study paid attention to guarantee the reliability and credibility of the results is presented in chapter 3.3.3.

3.3.1. Choice of case and theoretical framework

There are several reasons why the bus and truck manufacturer Scania CV AB in Södertälje was chosen for the test trial of the ride-sharing mobile application. First, the facility in Södertälje employs more than 12,000 employees of whom more than 80% take their private or company car to work, which results in daily traffic congestions as well as a lack of parking spots. Second, through Scania’s internal system it is possible to get access to employees’ company e-mail addresses and current living locations, which enables the possibility to specifically choose employees for the test trial, who live in the same region and work at the same department. Finally, the property management department, which is in the same building as the Research & Development (R&D) department, agreed on allocating ten parking spots for the test trial. Besides the physical aspects, which make Scania CV AB a suitable company for the case study, the mental factor of working for a company which attempts to build the most environmental friendly trucks and has visions in being a leading player in sustainable mobility, is hoped to have some positive influence on the results.

SPT is chosen as the theoretical framework to understand what determines the daily travel-behaviour. The theory focuses on participants’ every-day practices instead of individuals or infrastructures (Reckwitz, 2002). Using SPT to analyse the practice of ride-sharing will be helpful to get a deeper insight and understanding of how people explain their behaviour which is influenced by several actors and circumstances. Dividing the practice of ride-sharing into the three suggested categories elements of materials, meanings and competences as well as emphasising the interconnections between the elements will develop rich understanding of how practices are established, sustained or destroyed (Shove, et al., 2012). Knowing how different bundles of practices are linked with or dependent on each other will make it possible to understand the consequences of theoretical behaviour change strategies.

3.3.2. Data collection

Besides collecting empirical data in form of two quantitative surveys and qualitative semi-structured interviews, this project is based on a comprehensive literature review as well as secondary sources, such as webpages, reports and internal documents.

Figure 3 shows a timeline of the test trial and the data collection. The test trial started at the 13th and ended on the 31st of March 2017.

![Timeline of test trial and data collection](image-url)

The first *quantitative survey*, a questionnaire distributed via e-mail, was conducted during the start of the test trial and sent out to 451 participants living around Huddinge (south of Stockholm) and working...
at the R&D department of Scania CV AB. Information about employees’ current living location as well as department and e-mail addresses were provided by Scania and handled strictly confidential. The main purpose of the first survey was to show the participants’ current ‘home to work’ and ‘work to home’ commuting habits as well as to reveal their perception regarding ride-sharing. Likert scales (1-5) were used to show the main reasons, why participants would start ride-sharing. Appendix 2 shows the all questions and choices from the first quantitative survey.

The second quantitative survey, also distributed via e-mail, was conducted with the respondents from the first survey and took place after the test period of three weeks. The main purpose of the second survey was to investigate how many participants used the ride-sharing mobile application and to reveal their main reasons for not participating in the pilot project. This information was also revealed by using Likert scales (1-5). Statements included ‘In my opinion the main problem of ride-sharing is the loss of flexibility’, ‘... driving with a stranger’, ‘...being social in the morning’ and ‘... having to rely on others’. Furthermore, the survey addressed participants’ environmental concerns by asking how often they reflect on how their commuting habits impacts the environment. Finally, the survey provided a platform where participants can suggest improvements regarding the application or the process of ride-sharing. The quantitative data was collected and analysed by using ‘Google Forms’.

To receive a deeper understanding of participants’ perception of ride-sharing as well as to disclose possible concerns or problems, a quantitative survey consisting of 16 semi-structured interviews were conducted after the test trial. Semi-structured interviews are especially suitable to collect data based on the theoretical framework, while at the same time the interviewer has the freedom to ask possible follow up questions (Robson, 2011). To eliminate the risk of bias and only interviewing participants who either approve or disapprove the practice of ride-sharing, not only employees who downloaded and used the application were interviewed but also employees, who refused to use the application due to several different reasons. Most interviews (12 out of 16) were conducted in a personal face to face setting while three interviews were conducted via phone. To preserve personal information, this study uses only fictitious names.

### Table 1: Interview participants

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Application downloaded</th>
<th>Preferred way of commuting</th>
<th>Interview</th>
<th>Interview date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulf, male, 58</td>
<td>No</td>
<td>car</td>
<td>personal</td>
<td>17-03-28</td>
</tr>
<tr>
<td>Josef, male, 37</td>
<td>No</td>
<td>car</td>
<td>personal</td>
<td>17-03-28</td>
</tr>
<tr>
<td>Robert, male, 33</td>
<td>Yes</td>
<td>car</td>
<td>personal</td>
<td>17-03-28</td>
</tr>
<tr>
<td>Eva, female, 37</td>
<td>No</td>
<td>car, bus, bike, walk</td>
<td>personal</td>
<td>17-03-29</td>
</tr>
<tr>
<td>Lena, female, 49</td>
<td>No</td>
<td>SJE, train</td>
<td>personal</td>
<td>17-03-29</td>
</tr>
<tr>
<td>Karin, female, 48</td>
<td>No</td>
<td>car</td>
<td>personal</td>
<td>17-03-29</td>
</tr>
<tr>
<td>Erika, male, 36</td>
<td>No</td>
<td>car</td>
<td>personal</td>
<td>17-03-29</td>
</tr>
<tr>
<td>Liselotte, female, 50</td>
<td>No</td>
<td>car</td>
<td>personal</td>
<td>17-03-29</td>
</tr>
<tr>
<td>Niklas, male, 44</td>
<td>Yes</td>
<td>car</td>
<td>personal</td>
<td>17-03-29</td>
</tr>
<tr>
<td>Pär, male, 31</td>
<td>No</td>
<td>SJE</td>
<td>personal</td>
<td>17-03-31</td>
</tr>
<tr>
<td>Anna, female, 28</td>
<td>Yes</td>
<td>bus, train</td>
<td>personal</td>
<td>17-03-31</td>
</tr>
<tr>
<td>Annika, female, 39</td>
<td>Yes</td>
<td>car</td>
<td>personal</td>
<td>17-03-31</td>
</tr>
<tr>
<td>Anton, male, 28</td>
<td>Yes</td>
<td>SJE</td>
<td>phone</td>
<td>17-05-03</td>
</tr>
<tr>
<td>Frida, female, 29</td>
<td>Yes</td>
<td>car, train</td>
<td>phone</td>
<td>17-05-04</td>
</tr>
<tr>
<td>Oscar, male, 36</td>
<td>Yes</td>
<td>car</td>
<td>phone</td>
<td>17-05-08</td>
</tr>
<tr>
<td>Laura, female, 38</td>
<td>Yes</td>
<td>car</td>
<td>phone</td>
<td>17-05-08</td>
</tr>
</tbody>
</table>

3.3.3. Quality assurance

Achieving reliability and validity is of very high importance in any research study (Bryman, 2016). The first two columns of Table 2 are summaries of Bryman’s (2016) and Riege’s (2003) detailed descriptions of how to assure reliability and validity throughout case studies as well as quantitative and qualitative surveys, while the third column indicates how his suggestions were applied during this project.
Table 2: Techniques to ensure validity and reliability in case studies. (Based on Riege (2003; p.78-79); modified and applied on project by author)

<table>
<thead>
<tr>
<th>Case study design tests</th>
<th>Case study techniques</th>
<th>Applied in this project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construct validity</td>
<td>Use of multiple sources of evidence during data collection</td>
<td>Qualitative/quantitative surveys; literature review; internal documents</td>
</tr>
<tr>
<td></td>
<td>Create chain of evidence in data collection</td>
<td>All interviews were transcribed, quantitative survey results were documented</td>
</tr>
<tr>
<td></td>
<td>Review of case study reports</td>
<td>Interview transcripts were resubmitted to interviewees for approval</td>
</tr>
<tr>
<td>Internal validity</td>
<td>Display illustrations and diagrams in the data analysis phase</td>
<td>Illustrations and diagrams are presented</td>
</tr>
<tr>
<td></td>
<td>Consistency of findings</td>
<td>All findings were included in the same theory (SPT)</td>
</tr>
<tr>
<td>External validity</td>
<td>Determination of scope and boundaries of research design</td>
<td>See chapter 3</td>
</tr>
<tr>
<td></td>
<td>Comparison of evidence with present literature</td>
<td>See data analysis</td>
</tr>
<tr>
<td>Reliability</td>
<td>Record observations and actions as concrete as possible</td>
<td>Interviews subscribed; questionnaires documented</td>
</tr>
<tr>
<td></td>
<td>Use of a structured or semi-structured case study protocol</td>
<td>See appendix 4</td>
</tr>
<tr>
<td></td>
<td>Record data mechanically</td>
<td>Interviews were recorded</td>
</tr>
<tr>
<td></td>
<td>Assurance of meaningful parallelism of findings</td>
<td>Same framework used for all collected data</td>
</tr>
<tr>
<td></td>
<td>Use peer review/examination</td>
<td>Feedback from peers after proposal and presentation;</td>
</tr>
</tbody>
</table>

3.4. Ethical considerations

As a researcher, it is very important to follow ethical principles, which have been summarized by Diener & Crandall (1978):

- Harm to participants
- Lack of informed consent
- Invasion of privacy
- Deception

The qualitative and quantitative surveys were conducted with respect to these four ethical principles. Harm to participants, which can be broken down as physical harm; harm to participants’ development; loss of self-esteem or stress (Bryman, 2016), was avoided by not judging the respondents’ opinions in any way, which is a main characteristic of SPT (Hargreaves, 2011; Shove, et al., 2012). Lack of informed consent was avoided by thoroughly informing the participants about the purpose of this survey. Furthermore, participants were not forced to answer the questionnaire or take part in the ride-sharing test-trail. An example of Invasion of privacy is if people agree to be interviewed but still refuse to answer certain questions such as questions about their income, religious beliefs or sexual activities (Bryman, 2016). In this work, such private insights were not relevant, however autonomy and confidentiality were warranted during the entire process. If a participant still felt discomfiting to answer a certain question, he or she was of course not forced to do so. Deception occurs if researchers misleadingly pretend that their work would have a different purpose than it truly has. Usually the reason for deception is to keep
the participants’ understanding at a low level, so that they respond unaffected to the experimental procedure (ibid.). To keep the study as professional as possible, deception was completely left out. As mentioned before, the participants were thoroughly informed about the purpose of the research which left no space for hidden agendas.

3.5. Data analysis

In this study, quantitative data was collected using ‘Google Forms’, which is an internet based survey software, able to create simple descriptive statistics and graphs. Since the purpose of the two quantitative surveys was to create a basis for the qualitative surveys, this software was sufficient enough to receive adequate results.

Qualitative data, derived from interviews, usually sum up in a large pile of unstructured textual material which is not straightforward to analyse (Bryman, 2016). To find a remedy, the approach of thematic analysis was applied, which indicates that statements were clustered in ‘theory-related material’ (Bryman, 2016, p. 586). The contents thus were analysed with the framework of SPT, which does not only focus on its three elements but also on the significant interconnections of elements, which in combination establish, sustain or destroy the practice. The data analysis included the grouping of information while looking for similarities and differences. This method of analysing qualitative data can be understood as a mixture of a deductive and inductive approach. Deductive because the framework of SPT affects the interview questions and inductive because data is grouped according to coinciding statements.

3.6. Limitations

This work involves a case study, which data collection consists of two quantitative questionnaires and 16 semi-structured interviews. Bryman (2016) argues that it is not possible to know how to generalise a small number of quantitative interviews of an organisation or locality. He continues that ‘the findings of qualitative research are to generalize to theory rather than to populations’ (p. 399). Due to Scania-internal regulations, the test trial was restricted to a maximum of 450 employees, living in the same area and working at the same department. Besides adding one information e-mail which explains the process of ride-sharing, no further advertisement was allowed. Furthermore, the time period for the test trial was limited to three weeks. The reason for those strict regulations is that if Scania refuses to continue investing in this project, not too many employees will be irritated about the disappearance of the ride-sharing application. Conducting the test trial with 450 randomly selected participants (of 12,000 possible options) who live in different areas around Södertälje and work in variable departments, could have resulted in no overlapping routes at all. The result from a study with randomly selected participants would thus not accord with the approach of publishing the ride-sharing application to all 12,000 employees at once. The last limitation is the fact, that the design of the application was given and hence no part of this project. Finally, it is important to mention that this study is no longitudinal study but rather a snapshot of the current situation.
4. Empirical Background and context

This chapter explains the current traffic situation at Scania and presents functionality of the mobile application, developed for Scania employees.

4.1. The traffic situation at Scania

Scania CV AB, a global supplier of trucks, busses and engines, employs almost 44,500 people worldwide of which about 12,000 work at the headquarters in Södertälje, Sweden (Scania CV AB, 2015). Södertälje is a city with about 80,000 inhabitants, located approximately 30 kilometres south of Stockholm. During the last 20 years, the company more than doubled the number of employees, which entails a simultaneously increasing area for parked cars since the majority of employees lives in places around 10-40 kilometres away from Södertälje. Thus, more and more former green areas are torn down to provide enough parking spots for about 8,000 cars (stand 2017). This transformation is especially visible at the R&D department of STC (Scania Tekniskt Centrum) where in the beginning of the year 2017 another green area had to yield to parking spots (Fig. 4., red circle). It is obvious that the trend of constantly increasing the number of parking spots is not sustainable.

Another traffic related issue, more parking spots cannot solve, is the daily occurring traffic congestion, which is even worse at departments, where employees do not have flexible working hours and start respectively finish work at the same time. Even if the department of R&D has flexible working hours, the number of cars in combination with the design and lay-out of the roads, create daily traffic congestions. It is obvious that continuously building more parking areas is not a sustainable trend and a new approach to address this tendency is needed. A previous project with the aim to reduce the number of cars is the Scania Job Express (SJE) introduced in 2012. SJE is an internal bus system which picks up employees at two different locations, Stockholm centre and Liljeholmen centre. Even if the project

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Fig. 4.: Bird's eye view of STC in Södertälje (Source: Google Maps, before 2017, ‘red circle’ added by author)
shows successful results in reducing the number of cars, it is still not enough to stop the growing necessity of parking spots at Scania’s working site.

4.2. The mobile application

In August 2016 two co-workers form Scania in Södertälje took part in the yearly ‘Scania HACK’, an event organised by Scania to develop and discuss sustainable ideas which could be part of Scania’s future. Motivated by the daily occurring traffic congestions created by Scania employees starting to back for home, they came up with an idea to reduce the number of cars and thereby decrease the congestion and parking problem. The discovery they made was that most of the vehicle occupants were driving alone, which led to the idea to develop a mobile application, which simply brings driver and passenger together to share their trip to and from work (Scania IT, 2016). The application they developed is called ‘C catchy Ride’.

To ensure that only Scania employees use the application every participant needs to insert his or her Scania internal e-mail address. The application then sends a personal code to this address which must be validated in the application. After this procedure, the application is unlocked and ready to use. As a next step the user is asked to insert his or her phone and license plate number. That information is necessary to contact the driver or the passenger and agree upon further details such as pick up points.

The first screenshot of figure 5 shows the plain home screen of the ride-sharing application which leads straight to the options of either offering or finding (searching) a ride. If the user decides to offer a ride, the application asks for departure and destination details as well as departure time (second figure from the left). Furthermore, it is possible to repeat the offer for any day of the week if the daily routine does not deviate. If the user respectively tries to find a suitable ride, the application will list all offered rides chronologically, beginning with the soonest (third figure from the left). Having found a suitable offer, one can book it through the app and wait for the driver’s confirmation. The chosen trip also shows the driver’s name and licence plate number as well as a map which exemplifies the route the driver is about to take (right figure). This feature enables passengers to see if it is possible to be picked up or dropped off on the way.

![Fig. 5.: Screenshots of Catchy-Ride application: (from left to right) home-screen; offering a ride; searching a ride; detailed ride information.](image-url)

While motivating participants to conduct ride-sharing, incentives play an essential role (Brownstone & Golob, 1992). The purpose of incentives is to encourage a specific group of people to action or greater effort (ibid.). In the case of ride-sharing for employees, such incentives could be lunch coupons, dedicated parking spots, financial benefits, et cetera. In this project, due to internal regulations, lunch coupons as well as financial benefits were not possible to implement during the test trial. Possible incentives however were ten dedicated parking spots, which were provided for the pilot project by the facility department to only be used by participants who offered their ride and shared it with other...
employees. In case the ride was shared on the way home, the parking was available for the driver the following day. The reserved parking spots were marked with the following sign (Fig. 6.) to clearly show who is permitted to use them. To ensure that only users of ‘Canny Ride’ park on these parking spots, the application automatically sends the corresponding license plate numbers to an external website. This website can be accessed by a Scania internal security service company, who daily controls the parked cars. By comparing the parked cars’ license plates with the plates on the list, the security company can control who has the permission to park there. In case an employee illegally parks on one of the reserved parking spots, a so-called ‘soft fine’ will be attached to the windshield which explains the legislations of the test trial and indicates the driver to change the parking place.

Fig. 6.: Parking sign for Canny-Ride users only. (Designed by application developer)
5. Empirical Results

This chapter presents the empirical results, collected with two quantitative questionnaires, one before the test trial and one after, and 16 semi-structured interviews.

5.1. First quantitative survey

The first quantitative survey was distributed via e-mail in the beginning of the ride-sharing test-trial to 451 participants of which 143 replied (31.7 %). All numerical data written in percentage are kept one digit behind the decimal point.

Among all participants, 104 (72.7 %) are male, 39 (27.3 %) are female, which reflects the male-female distribution for all employees at Scania in Södertälje (75% male; 25% female). Participants’ age distribution varied as shown in figure 7.

![Distribution of participants' ages (1st survey).](image)

**Fig. 7:** Distribution of participants’ ages (1st survey).

The next part of the survey considers the participants’ usual mean of transportation for their daily home-work and work-home commute (figure 8). 115 (80.4 %) respondents stated that they take their car to work while 15 (10.5 %) use public transportation; 4 (2.8%) take the Scania internal Job Express (SJE); 1 (0.7 %) walks and 1 (0.7 %) bikes; the rest (4.9 %) uses a combination such as “Scania Job Express på vinter, egen bil på sommar” [SJE in the winter, own car in summer] or “one way by bus/train and the other way by car”.

![Participants' mean of transportation](image)

**Fig. 8:** Participants’ mean of transportation
The following question refers to the number of passengers, which participants share their ride with when driving to work. In the results of this question, four answers were removed since the participants stated that they do not possess a car and thus never drive to work. This correction leaves 139 responses of which 117 (84.2 %) do not have any passenger in their car, 16 (11.5 %) have usually one passenger 1 (0.7 %) has two passengers and 3 (2.2 %) have three passengers. Two participants stated that they “sometimes [take] wife or kids half the way” and “Lämnar/ hämtar [barnen] på förskola” [Leave/ pick up [children] from preschool]. To reveal how satisfied participants are with their way of commuting the next question uses a Likert scale from 1 (not satisfied) till 5 (very satisfied). The results are shown in figure 9.

![Figure 9: Satisfaction of current commuting situation (Likert scale)](image)

Only 20 (14 %) out of 143 respondents think that it is never difficult to find a parking spot at STC while 85 (59.4 %) think it is sometimes difficult. The statement of “It is often difficult” applies to 22 (15.4%), “very often” to 7 (4.9%) and 9 (6.3%) find it “always complicated” to find a parking spot. The question of “Did you ever use a ride-sharing mobile application?” was answered with 97.2 % ‘yes’ and 2.8 % ‘no’. The following four replies (figure 10) indicate the different values why participants would start ride-sharing. (Likert scales: 1 = false; 5 = true)
Fig. 10.: Distribution of reasons for ride-sharing. (Likert scale)
The purpose of the following question was to reveal incentives which would motivate employees to start ride-sharing. 40 participants chose the option to write an individual answer which means that they will be excluded from the respondents, so that the amount of replies decreases from 143 to 103. Another 31 respondents stated, that they would never try ride-sharing despite the incentive. To get a meaningful result, those 31 replies will also be removed which leaves this question with 72 responses. The most common option with 40 (55.6 %) replies was ‘financial benefits’, while 12 respondents (16.7 %) stated that it would be most important that their colleagues also started ride-sharing. 11 (15.3 %) respondents preferred ‘dedicated parking spots’ and 9 (12.5 %) “lunch coupons”. Individual answers were for example:

‘I can’t, need to pick up kids’; ‘Good timing alternatives’; ‘If no available parking I would consider ride-sharing’; ‘if it would not take more time’ and ‘Att det går smidigt och att jag inte behöver anpassa mig för mycket. Vill också kunna åka hem för VAB om det behövs.’ [That it goes smoothly and that I don’t have to adapt too much. I also want to be able to go home if my child gets sick.].

The last two questions related to the openness towards ride-sharing from a driver’s and passenger’s perspective. Here, as well, Likert scales were used with 1 = ‘not open’ and 5 = ‘very open’. The results show that there is no big difference between sharing a ride as a driver or as a passenger. The exact distribution is shown in figure 11.

![Diagram](https://via.placeholder.com/150)

**Fig. 11.** Distribution of openness towards ride-sharing from a driver’s and a passenger’s perspective. (Likert scale)
5.2. Second quantitative survey

The second quantitative survey was distributed via e-mail about three weeks after the start of the test-trial. It was sent out to the respondents from the first survey (n=143) of which 65 (45.5%) replied. The main purpose was to find out how many participants downloaded the mobile application, respectively shared their rides to work as well as to reveal the reasons for refusing to use this shared mean of transportation. The distribution between the sexes (27.7% female, 72.3% male) was like the first survey and thus equivalent to the sex distribution among all employees at Scania in Södertälje. The distribution of participants’ ages was similar to the first survey and is shown in figure 12. The ages between 18 and 25 as well as 65+ were not selected in the second survey so they are excluded from the chart.

Out of 65 respondents, 57 (87.7%) stated that they did not download the mobile application while 8 (12.3%) respondents had downloaded the application. To be sure that there are no participants who used the application but did not reply to the questionnaire, the names of 451 employees who were invited to take part in the first survey were compared with the names of all employees who downloaded the application. This comparison revealed that besides the eight participants who downloaded the application and were part of the first survey, no further participants downloaded the application. The application revealed that out of 451 participants, who were invited to use the mobile application during the test trail, 8 (1.8%) also downloaded it.

The next question was only directed to those respondents who downloaded the application (n = 8) and focuses on how they used it. Two (25%) participants stated that they searched for a suitable ride, two (25%) participants stated that they downloaded the application but never used it and three (37.5%) participants stated that they offered a ride. The remaining participant who downloaded the application stated that he “Downloaded it but it did not work at all”.

The next part of the questionnaire focuses on the negative aspects of ride-sharing respectively the main problems participants connected with this shared mean of transportation. To get a detailed result the question was divided in 4 different parts: “…the loss of flexibility”, “…driving with a stranger”, “…being social in the morning” and “…having to rely on others”. Using Likert scale (1 = false; 5 = true), respondents could decide how much they agreed to these statements. Figure 13 shows the results.
Fig. 13.: Participants’ opinion regarding main problems of ride-sharing. (Likert scale)

The last part of this question was called “other”, where respondents could write down further problems in terms of ride-sharing which have not been mentioned above. Six respondents used this option and wrote for example, “Very difficult if you have kids, where you may need to continue the journey and be
in on time. And the problem of lack of time, where very minute counts.” or “I have irregular working hours, I do errands to and from work almost every day.” and “Svårt när man ska lämna barn på förskola. Tiden på morgonen kan variera mycket.” [Challenging, if one leaves the kid at preschool. The time can vary a lot in the morning].

The last question in the second questionnaire refereed to participants’ conscious regarding the environmental impact in terms of their commuting habits. The question was “How often do you reflect on how your commuting habits impact the environment?” Again, using Likert scale, respondents had the choice between 1 = ‘never’ and 8 = ‘every day’. Figure 14 shows the distribution with numbers and percentages.

Fig. 14.: Participants’ reflection on the environmental impact of their commuting habits. (Likert scale)

5.3. Qualitative survey

The qualitative survey, which consisted of 16 semi-structured interviews was conducted after the three-weeks test-trial and after the second quantitative survey. The results from the quantitative questionnaires revealed, among others, commuting patterns, which were further explained by conducting semi-structured interviews. To receive a detailed overview of diverse perceptions regarding ride-sharing, interviews were not only conducted with participants who downloaded the application but also with those who refused to use the application.

5.3.1. Current way of commuting

While most interviewees use their private car to get to and from work, two interviewees who do not possess a car, use the train (pers.com., Anna, 2017) or the bus (pers.com., Lena, 2017). Two further interviewees (pers.com., Pär, 2017; pers.com., Anton, 2017) indicated that they possess a private car but usually take the SJE and only use their private car if they either overslept or needed the car after work. Frida (pers.com., 2017) takes the car 40% of all times and the train 60%, depending on what she is planning on doing after work. Distances from home to work reached from five (pers.com., Karin, 2017) to 60 kilometres (pers.com., Robert, 2017). Most participants had a steady, solely changing commuting routine. One exception was Eva (pers.com., 2017) who, depending on the weather, takes the car, the bus, the bicycle or walks to work. Interviewees were predominantly satisfied about their way of commuting. Increasing traffic during rush hours was not considered a big problem by the interviewees since flexible working hours allow to adapt to traffic situations.

“[…] I try to go a little bit earlier to avoid the traffic. Sometimes when I’m late it´s more traffic so it can take some time. ” (pers.com., Liselotte, 2017).

Interviewees especially enjoy the freedom of driving themselves and thus being more spontaneous and flexible (pers.com., Liselotte, 2017). Commonly reported however, were the arising costs of daily driving a private car to work.
“It’s [taking the car to work] more expensive than taking public transportation. So, if I would take […] the commuter train, it would be a quarter of the price […]” (pers.com., Robert, 2017).

Anton (pers.com., 2017) who lives close to the SJE bus station, prefers to take the bus instead of his private car because it is cheaper.

“The biggest contribution [of taking SJE to work] is that it saves me money. Second maybe is the environmental effects and third is the convenience. Of course, it’s a combination but I would say that monetary reasons play the biggest part.” (pers.com., Anton, 2017).

Despite the costs, the advantages of private cars compared to public transportation potentially outweigh the disadvantages. This becomes especially obvious in terms of time saving (pers.com., Robert, 2017; pers.com., Oscar, 2017).

“[…] I think that the car is half the time compared to if I would go to the train. First go to the train, and then take the train with different changes.” (pers.com., Niklas, 2017).

Laura (pers.com., 2017) takes her private car to works because she just “hate(s) waiting”, or spending time outdoors when the temperatures are low.

5.3.2. Experience of ride-sharing

To have neighbours, who also work at the same company simplifies the theoretical process of ride-sharing since not only the destination but also the starting point coincide and driver and passenger already know each other, which increases the trust. However, it turned out that in some cases interviewees did not know who their neighbours were and they could only guess where people worked.

“No, I don’t know about that. I would believe that I have quite a lot of colleagues, who live nearby where I live.” (pers.com., Liselotte, 2017).

“Not so close I think. At least I don’t know about it.” (pers.com., Ulf, 2017).

In most cases though, interviewees knew their close neighbours and could say if they were working at the same company. In special situations, they occasionally arranged private ride-sharing for a shorter period of time. For example, Josef (pers.com., 2017) shared his ride with a neighbour who suffered from a stroke and could not drive his own car for three month, while Karin (pers.com., 2017) described that she spontaneously gave one of her neighbours a ride to work because he stood next to her car and asked if she was driving to Scania. Similarities are seen in Pär’s (pers.com., 2017) statement, who usually uses the SJE but since he has a colleague living close by, they sometimes drive home together, while Annika (pers.com., 2017) mentioned a neighbour who does not only work at the same company but also drives his kids in the same kindergarten as she does, however they never drove to work together. Niklas (pers.com., 2017) who knows at least 10 people living in his area and working at Scania, tried ride-sharing on a regular basis before.

“[…] we tried to go together. We said we wanted to do it more often but it was actually not that often. Maybe once a month. Maybe once every two weeks. More when one of us needs it.” (pers.com., Niklas, 2017).

Also, Anton (pers.com., 2017) made similar experiences.

“Sometimes I share a ride with a colleague that lives close. […] And also, I have a neighbour that works at Scania and he gave me a ride a few times but not regularly.” (pers.com., Anton, 2017).

Laura (pers.com., 2017) did ride-sharing about 10 years ago. One reason why she “[…] really liked it.” was because she made a new friend whom she might not have met before. Nowadays, she only shares a ride with her neighbour if her or his car is broken.

Reaching the “critical mass”, i.e. the number of participants at which the ride-sharing system becomes sustainable, is an essential part and critical during the first weeks of the implementation. Niklas (pers.com., 2017), Anton (pers.com., 2017) and Annika (pers.com., 2017) stated that after offering rides
for a few times without getting any responses back, they quickly lost motivation to continue. Oscar (pers.com., 2017) who downloaded the application, stopped searching after he could not find a suitable ride two times in a row.

5.3.3. Perception of ride-sharing

The perception about the concept of ride-sharing was overall very positive however statements such as “I think it’s a good idea, a very good idea.” (pers.com., Erik, 2017) or “I think it’s a great idea” (pers.com., Annika, 2017) were often followed by explanations why one still did not try ride-sharing. Such explanations were for example “[…] if you don’t have to have the flexibility like I need.” (pers.com., Erik, 2017) or “[…] I don’t think it would be so easy to find someone who has the same kind of a schedule that could join and lives in the same area or that would travel with [me].” (pers.com., Annika, 2017).

Anna (pers.com., 2017) saw potential in ride-sharing to ease the daily commute to work. “I think it’s good. I think if I knew everybody around me in the same area and if I knew who worked at Scania and who has a car, I think it would be easier to get to work.” (pers.com., Anna, 2017).

Lena (pers.com., 2017) also thinks ride-sharing was a good option especially when “[…] you know people around you. You just call your neighbour and say “Hello, where are you going today? Can I have a ride with you?” It’s especially easier if you know people at work so you can talk with each other during lunch time.”.

Ride-sharing was not only seen as a solution to ease the daily commute to work (pers.com., Anna, 2017) but also to reduce the number of cars at the company parking lot and to reduce the environmental impact (pers.com., Karin, 2017).

“It’s a very good idea. Because I, like everybody else, I’m annoyed about the parking situation at Scania. It is always a problem with parking, but also of course because of the environment.” (pers.com., Karin, 2017).

When Frida (pers.com., 2017) sits alone in her car and realises that there is only one person in every car around her she even thinks that “it hurts in my soul.” (pers.com., Frida, 2017).

5.3.4. Perceived negative aspects of ride-sharing

According to most interviewees, the loss of flexibility is considered the biggest disadvantage in terms of ride-sharing especially for the passenger.

“[…] when you are the passenger, you feel like the flexibility is with the driver. When the driver says: “I go at seven”, ok then it’s up to me. Can I follow at seven or do I need to find another way to go?” (pers.com., Erik, 2017)

The loss of flexibility was explicitly a big concern when interviewees had children which must be brought to or picked up from day-care or school (pers.com., Erik, 2017; pers.com., Karin, 2017).

“It’s the flexibility. If you have small children, things happen. And then they call from school: “Oh he’s sick!” then you know you can just go home in a minute.” (pers.com., Karin, 2017).

Besides the loss of flexibility, Josef (pers.com., 2017) mentioned that it is very important for him to “constantly know how you can come home.”, not only when the kids get sick but also when the colleague you were planning on driving home with suddenly must leave earlier. Anton’s (pers.com., 2017) comment adds up to the previous statements. To the question of what are the biggest barriers in terms or ride-sharing he stated:
“Oh, it’s definitely the flexibility. I think that is a crucial part to get it going. If I take a ride to work, how do I know how I get home or if I want to get home at a specific time. So, the flexibility is one big thing.” (pers.com., Anton, 2017).

The importance of staying flexible was stated by 15 out of 16 interviewees.

One example which shows how important flexibility can be is the case of Annika (pers.com., 2017) whose husband also works at Scania. Since they must bring their kids to the day-care centre, they decided to drive separately with their private cars to work and take different turns on who leaves the kids and who picks them up.

“I have a schedule and then it’s worked out with my husband that works here as well. […] So if no one else is offering me a ride on that very specific route on that specific time, then it’s not going to work.” (pers.com., Annika, 2017).

That losing flexibility does not always have to be a problem shows the example of Robert (pers.com., 2017) who used to conduct ride-sharing for several years without any problems.

“So, I mean by my experience, there are no big issues. I don’t think we had any problem what so ever when I was working there for five years and we were commuting for the whole time.” (pers.com., Robert, 2017).

The fact of having to be social and talk to the people you are driving with was also mentioned a few times. While some enjoy sitting in the car and just listening to the radio (pers.com., Erik, 2017; pers.com., Liselotte, 2017) others prefer having “some company on the way to work.” (pers.com., Niklas, 2017). Anton perceives the ‘Swedes’ as “not always that talkative” and that “Some people might see it as a nice relaxing time to drive home and just be by yourself with no kids and no colleagues.” (pers.com., Anton, 2017). Liselotte (pers.com., 2017) mentioned an example of three colleagues of hers who regularly share their rides to work. “[…] they sleep in the car so they are not so social in the morning. So, it’s quite relaxed. I think when you get to know each other it’s no big deal.”

In terms of security, participants were not very concerned since the application was only accessible for co-workers. Annika (pers.com., 2017) for example stated that “[…] I think that was for me a positive thing, that it is not just any stranger. It’s a colleague, even if I don’t know that person.”. A similar opinion had Nicklas (pers.com., 2017) who said:

“If it was ride-sharing with anybody I would feel like “ok, that is not secure”, but [if] it’s within a company or within an area, let’s say people that work here, then I wouldn’t have that concern.” (pers.com., Niklas, 2017). Frida (pers.com., 2017) also thinks it feels right to drive with a colleague. She even perceives all Scania employees as a “family”. (pers.com., Frida, 2017).

5.3.5. Environmental awareness

Most interviewees were concerned about climate change and explained that they tried to protect the environment by avoiding the car when possible (pers.com., Erik, 2017; pers.com., Robert, 2017), eat less meat (pers.com., Anna, 2017; pers.com., Annika, 2017; pers.com., Lena, 2017), or buy green electricity (pers.com., Anna, 2017). Frida (pers.com., 2017) stated that she prefers taking the train to work since she is aware of the environmental footprint which she creates by driving her private car. Others are less concerned about climate change: “It’s not something I think very much about.” (pers.com., Liselotte, 2017), “I don’t think about it every day […]” (pers.com., Karin, 2017). Josef (pers.com., 2017) and Laura (pers.com., 2017) are good examples for people who are aware of environmental change but not enough to adapt their lifestyles.

“I am aware that we are changing the climate by using fossil fuels, but I have a big engine in my boat as well […]” (pers.com., Josef, 2017).

“Not a lot, certainly not more than I am for my own comfort. I’d never NOT take the car out of climate concerns.” (pers.com., Laura, 2017).
The flexibility and convenience of driving a private car let the bad conscious of the environmental impact fall silent. This hypothesis is supported by several statements such as:

“I could manage without a car. It just makes my live easier to take the car. You take the car here and then you can go to the store on the way home. Otherwise I would have to plan more.” (pers.com., Karin, 2017) and

“[…] I would definitely avoid going by car if there were good alternatives and I think there are even good alternatives. […] right now, I’m in the “lazy mood” that’s why I’m taking the car.” (pers.com., Robert, 2017) or

“Yea, I think about it [leaving the car at home] but it still has more advantages.” (pers.com., Liselotte, 2017).

More influence on the mean of transportation than a bad environmental conscious had monetary factors such as petrol prices or tolls.

“[…] the key thing for me is the petrol price. You know before I had an old car and it took one litre per mile and now my new car takes just half a litre. So, I only have to pay half the price now.” (pers.com., Josef, 2017).

“I think I would stop driving the car if it was very expensive due to higher taxes or if the fuel price rises or tolls like in Stockholm would make me think of considering another alternative to commute.” (pers.com., Liselotte, 2017).

Niklas (pers.com., 2017) who stated to be “not the most concerned person” did not see environmental benefits as the main reason to start ride-sharing. He just thinks that “it is stupid that everybody drives alone in the car which is [designed] for five people. Empty spaces and too heavy cars. If people would go by motor bikes, that’s ok. They are built for one person only.” (pers.com., Niklas, 2017).
6. Analysis

In this chapter, the empirical results are analysed with the help of the theory and the conceptual framework of SP (chapter 2.4). The focus lies on the results of the qualitative interviews. The chapters are arranged following the three elements of the SPT: materials, meanings and competences. In the end of the chapter, examples for the interconnection of practices are explained.

6.1. Applying SPT

In this section, the conceptual framework (chapter 2.5), is applied to analyse the empirical results received through the qualitative survey (chapter 5). The results from the two quantitative surveys were primarily used to select interviewees and formulate questions. The results are divided in three parts, following Shove, et al.’s (2012) model of SPT with its three categories of elements: materials, meanings and competences. This way of analysing allows an enhanced vision of the practice of ride-sharing. As stated in chapter 2, SPT solely considers the practice itself, while the single individual only acts as a carrier of the practice (Reckwitz, 2002; Hargreaves, 2011). The findings are then used in the following chapter to discuss the insights SPT can provide in terms or ride-sharing.

Figure 15 shows a summary of the empirical results. The contents of the dotted boxes next to the elements are statements derived from the interviews and allotted to the corresponding elements.

Fig. 15.: Summary of findings presented with the frame of SPT.

6.1.1. Materials

In order to develop a new practice, different materials have to be created or changed (Spurling, et al., 2013). In terms of ride-sharing for Scania employees this meant to provide a self-explaining mobile application, which does not require an extensive introduction. As an incentive, ten dedicated parking spots, located close to the entrance, were determined. However, the quantitative survey revealed that the...
majority (59.4%) thinks that it is only ‘sometimes’ difficult to find a parking spot which partly explains that free parking spots as an incentive to start ride-sharing was not a convincing argument. Data from the first questionnaire indicated that for only 15.3 %, dedicated parking spots were the most popular choice, while financial benefits held the majority with 55.6 %.

Furthermore, the quantitative results revealed that 80.2 % use their private car to commute to work and out of those respondents, 84.2 % drive without a passenger, which provides a suitable basis for the introduction of a ride-sharing system. Living close to a co-worker is not specifically necessary to conduct ride-sharing, however it would simplify the process. Sharing the ride with a neighbour who also works at Scania has only been conducted occasionally, especially when an incident affected the usual way of commuting. This shows that the potential for ride-sharing exists in many cases, however a triggering incident is needed to see alternative means of transportation. The empirical data shows that it is very likely to fall back in old patterns as soon as physical or health reasons allow it.

Further important ‘material’ considerations to conduct ride-sharing were smart phones suitable to run the application and the legal permission to drive a car. While smart phones are necessary for all participants, the latter requirement is only needed for participants, who act as drivers. However, all interviewees were holders of a driver’s licence and only two (pers.com., Anna, 2017; pers.com., Lena, 2017) out of 16 did not own a private car. Furthermore, all Scania employees working at the R&D department possess a smart phone which serves as a company phone.

6.1.2. Meanings

Balke et al. (n.a.) describes meanings as the social significance which motivates an individual to participate at a practice at any time. The qualitative survey revealed this social significance in terms of ride-sharing is partly the motivation to reduce the personal environmental impact (pers.com., Erik, 2017; pers.com., Anna, 2017; pers.com., Robert, 2017). Niklas (pers.com., 2017) however, does not only see the environmental benefits being meaningful to start ride-sharing but also the fact that a car is produced for five people and thus should transport more than solely one person. Also, the possibility to save money by sharing driving related costs can be understood as a motivation to start ride-sharing.

On the contrary to a reduced environmental impact, stand the factors of convenience and flexibility, which are essential in today’s society (Shove, 2005). For almost all interviewees, the social significance of being a “green commuter” was not substantial enough to overcome the assumed reduction of flexibility which might come along if one shares a ride with another person. Statements such as “Yea, I think about it [leaving the car at home] but it still has more advantages.” (pers.com., Liselotte, 2017) or “I could manage without a car. It just makes my life easier to take the car.” (pers.com., Karin, 2017) applied for many participants. Especially if children had to be brought to and picked up from day-care, being flexible in the morning or having the certainty of being able to quickly leave work at any time during the day in case of a child’s sudden sickness, were stated as main advantages associated with driving a private car to work. Robert (pers.com., 2017) however, who has conducted ride-sharing for several years in the past, did not experience “[…] any problem, what so ever […].” (pers.com., Robert, 2017). He sees the reason for why it worked “very well” (pers.com., Robert, 2017) in the fact that he did not only share his rides with his co-workers, but he also worked “right in the same group” (pers.com., Robert, 2017) with them, which made it easier to arrange the daily commute.

Only a few participants who replied to the second questionnaire stated that “driving with a ‘stranger’” is a big (6.2 %) or a major (3.1 %) problem. These results coincide with what interviewees stated during the interviews. Niklas (pers.com., 2017) for example quoted that he would prefer to share rides with people “within a company or an area” and for Annika (pers.com., 2017) is was “[…] a positive thing, that it is not just any stranger.”. Those statements, in combination with the questionnaire results, reveal that if the test trial settings are within a company, security concerns do not play a major role.

Besides the social significance of living an environmental friendly lifestyle, monetary benefits are valid arguments to consider ride-sharing as an alternative mean of transportation (pers.com., Robert, 2017; pers.com., Liselotte, 2017; pers.com., Josef, 2017). Thus, higher costs e.g. for fuel, street tolls or
increased taxes would convince more participants to conduct ride-sharing and thereby share the incidental costs.

6.1.3. Competences

One important competence, which is necessary to conduct ride-sharing, is first and foremost to understand the practice of ride-sharing with its purpose and process. A further requirement is to have the know-how about the functionality of the ride-sharing application. To guarantee that everyone understands how to utilize the application, a brief introduction was sent out to the participants of the test trial, which also provided information about the location and the use of the dedicated parking spots. All interviewees who downloaded the application stated to have understood the features. Since every interviewee possessed a driver’s licence, it can be assumed that the competence of driving a car is existing.

The fact that only 4 (2.8 %) out of 143 respondents used a ride-sharing application before indicates how new the idea of ride-sharing appears to be for many participants. Even if the principle of ride-sharing is easy to understand, the fact, that it is completely new might discourage possible users to start using the application from the very beginning. Besides understanding the principle of ride-sharing respectively the mobile application, it is also important to be skilled in a social point of view. It is not a given for everybody to sit in a car for longer period of time and have a conversation with an unknown person. While some see this situation as a possibility to get to know new people others might feel overstrained or uncomfortable.

6.2. Interconnections

Analysing a practice with SPT does not only reveal its three categories of elements itself but also the links or interconnections between the categories or even between different bundles of practices which co-exist in everyday life (Warde, 2005). Potential links between different categories of elements in this study include for example the high environmental awareness on the one hand and the possibility to save petrol by sharing a ride on the other hand. Further examples are the connection between the low concern of driving with a stranger and the chance to meet new people while commuting to work, or the fact that it is hard to find a place to park when coming late to work and dedicated parking spots for employees who share their rides.

Reckwitz (2002) claims that individuals become “unique crossing points” (p. 256) of different bundles of practices which are linked with each other. Also, any change in one practice is likely to affect the other practice. In this study, an example for how bundles of practices affect each other is demonstrated in the one practice of taking the private car to work and the other practice of doing errands after finishing work. It would be possible to slightly change the first bundle of practice by sharing the ride to work with a neighbouring colleague, which would not require a lot of changes in terms of the daily commuting procedure. However, doing errands after work would either require the passenger to accept the detour or to search for another suitable ride. The driver’s procedure of doing errands thus highly influences the practice of getting home after work for the passenger. Similarities can be seen when employees have to bring their children to or have to pick them up from the day-care centre. At the same time, parents stated that they want to be able to leave work at any time during the day in case their children get sick. Combining the wish for flexibility with a shared mean of transportation is a challenging task. The general concern of losing flexibility might be the main reason which explains the resistance of changing from the traditional way of commuting towards a shared mean of transportation.

While trying to motivate people to change their commuting habit, all connected bundles of practices must be considered which quickly turns a small change into an extensive behaviour change project. An example for such an extensive project might be the foundation of a company internal day-care centre to reduce parents’ ‘need’ of flexibility. This concept might increase parents’ flexibility and thereby raise the potential of ride-sharing.
7. Discussion

Answering the research question as well as discussing and interpreting the study’s results and suggesting possible solutions is the content of this chapter. A methodological reflection about the study’s research methods and the conceptual framework is presented at the end.

7.1. What insights can social practice theory provide about ride-sharing for commuting travel?

With the help of multidisciplinary research and the framework of SPT, this study splits the act of ride-sharing for work commuting in single, corresponding elements. The theory allows to separately analyse every single element of the system and thereby reveals opportunities and barriers which are responsible for sustaining the practice. The three elements, suggested by of Shove et al.’s (2012), are:

- **Material**: ride-sharing application, cars, driver’s license, incentives, available seats in cars
- **Meaning**: social significance, sustainable lifestyle, ability to reduce costs, flexibility
- **Competence**: knowledge about purpose and process of ride-sharing and functionality of the application.

The results show that participants’ assumed loss of flexibility and independency are the main barriers, which prevent the practice of ride-sharing from prospering. Even if individuals see the advantages of ride-sharing, they are still not willing to sacrifice the flexibility and convenience of a private vehicle. This result was also shown by an early study from Levin & Dueker (1976). The empirical results of this study have shown that especially when participants were parents of young children, the flexibility to leave work at any time was very important. These outcomes differ from the work of the Italian researchers Gargiulo et al. (2015) who found out that the main barriers are “concerns about privacy and reliability of drivers and passengers.” (ibid., p. 777) and Furuhata et al. (2013), who also mention “trustfullness” (p. 45) as a major challenge for agencies. The reason for this disparity might lie in the different study settings. While Gargiulo et al. (2015) conducted his study with randomly selected citizens from Rome and Turin, the work at hand chose colleagues, working for the same company. Furthermore, Gargiulo et al. (2015) focused on a dynamic ride-sharing setting for every-day life instead of the daily commute to and from work as in this study. The interviews show that sharing a ride with colleagues lowers the trust barrier which makes ride-sharing an promising approach for companies to reduce traffic congestions.

The study also shows, that even if participants’ comprehension in terms of car related emissions, in combination with environmental concerns is rather high, it is not enough to influence a shift towards a more sustainable way of commuting. This finding coincides with the study from Barr & Prillwitz, (2014), who stated that “the living of everyday life necessitates forms of unsustainable mobility” (p. 9). In other words, for many people it is not compatible to achieve the ‘needed’ practices while choosing a mean of transportation with less environmental impact. A suggestion to address this problem could be an extensive educational campaign regarding the impacts of daily single occupancy driving, which could attract attention and motivate employees to reconsider the necessity of their daily commute, which could cause a boost for the idea of ride-sharing.

Before the trial, 94 (65.7 %) out of 143 participants claimed to be open or very open to try ride-sharing, yet only 8 (5.6 %) employees downloaded the application during the test trial, which reveals a big gap between the claimed willingness of participating compared to the actual active participation. The resistance to change the mean of transportation could have several reasons. One reason could be the fact that ride-sharing is for most participants an entirely new way of travelling and they want to see how it works before they try it themselves. The low participation rate shows the importance of conducting a test-trial in real-life settings instead of solely relying on the results of questionnaires (Gargiulo, et al., 2015) or computational methods (Xu, et al., 2015; Kamar & Horvitz, 2009). Epperson (2015) made similar experiences, when having a low participation rate during different phases of his ride-sharing study.
pilot project in Santa Barbara County. The following statement of Spotswood et al. (2015) shows the importance of a high participation rate during a pilot project: “If people do not engage with a practice and do not see others engaging with it, they come to understand the world as a place where the practice does not ‘fit’.” (p. 24), which means that if there is no feedback from current users, no new users will join the practice.

Since the personal (reduced costs) and public (less traffic congestions, less emissions, more available parking spaces) advantages of ride-sharing are not enough to reach a critical mass, various kinds of incentives were suggested to motivate employees to participate in the ride-sharing test trial. According to the first questionnaire, the incentive with the highest acceptance among participants were monetary benefits, which is in accord with the study from Stiglic et al. (2016), who suggests using financial benefits to “reward participants for being more flexible.” (p. 191). It also coincides partly with the study from Brownstone & Golob (1992), who’s simulations predicted that the combination of preferential parking, high occupancy vehicle lanes, financial subsidies and guaranteed rides home can reduce single occupancy driving by 11 to 18%. However, these predictions cannot be generalised since every company has different preconditions such as the parking situation or the volume of traffic.

Considering the potential loss of flexibility as a given for the user of ride-sharing, an alternative approach is necessary to turn the practice of ride-sharing into a success. Besides constantly increasing financial incentives, such an approach could be to redesign the responsible circumstances, which create the ‘need’ of flexibility. Spurling et al. (2013) describes this approach as “Rather than viewing this mobility as given, [...] we might intervene in the wider system of practices which produces the need for mobility. In other words, patterns of mobility, or private car use, might have nothing to do with transport policy at all, but be connected to how households are provisioned, where children go to school, how work and leisure are conducted, and so on.” (p. 29-30). The two most often stated reasons for the need of flexibility were children, which have to be brought to the day-care centre and errands, mostly in terms of grocery shopping. A solution, suggested by the author, to reduce the need for flexibility could be a Scania internal day-care centre for employees’ children or nearby located grocery stores. Another potential approach could be to motivate employees to share their rides to work by closing a number of the already existing parking spots and lock them with a gate which can only be opened if two or more people are sitting in the car. This approach would ease the parking situation for shared vehicles while complicating it for single drivers.

7.2. Methodological reflections

Social Practice Theory has proven to be a suitable framework to analyse ride-sharing for the daily commute to and from work because it provides a better understanding of the practice’s elements and its complex interdependencies. SPT helps to understand what creates, sustains or destroys a practice which is essential for implementing a practice change. In this project, supporters’ and opponents’ perception of ride-sharing was analysed with the framework of SPT which lead to a comprehensive understanding of the practice’s upsides and downsides. That information can be used for future research in terms of ride-sharing for commuting practices. The separated way of collecting data, meaning two questionnaires with the purpose of receiving a big number of responses and subsequent interviews to gain a deeper understanding, was a revealing procedure. Furthermore, the approach of conducting a test trial in a real-life setting was important since it revealed the contrast between the low interest in conducting ride-sharing compared to the declared “openness” towards ride-sharing from the questionnaires.
8. Conclusion and further research

This chapter concludes the findings and solutions and suggests possible research topics for future studies.

Motivating people to switch their daily home-based work commute from single occupancy driving to a shared mean of transportation is a complex task. Besides the personal and public advantages which ride-sharing implicates, such as less driving related costs, a reduced environmental impact or less traffic congestions, it also creates drawbacks such as losing flexibility and independency. The aim of this research has been to identify what insights SPT can provide about ride-sharing for commuting travel. To reach this aim, more than 450 participants have been invited to take part in a test trial lasting for three weeks. During this test trial, participants have been asked to download a ride-sharing mobile application, tailored for Scania employees. As an incentive, ten dedicated parking spots have been provided. Before and after the trial, questionnaires have been conducted, followed by 16 semi-structured interviews. Analysing the empirical results with the framework of SPT, has revealed that even if the environmental awareness among participants is high, the drawback of losing flexibility, due to sharing a ride with another person is responsible for the low participation rate. In fact, only 24 (5.3 %) out of 451 participants have downloaded the ride-sharing application and even less have offered or searched for rides. The concern of security or trust in terms of driving with an unknown person, as identified in previous studies, has not been described as a reason for declining ride-sharing. This result can be ascribed to the specific test trial settings. According to the first questionnaire, the incentive with the highest agreement among the participants has been the implementation of financial benefits. However, the specific amount of money which would convince people to start ride-sharing has not been investigated.

As a concluding remark to turn ride-sharing into a promising mean of transportation, it is suggested to change the responsible circumstances, which create the ‘need’ of flexibility. Those circumstances are for example the fact that many employees must drop off or pick up their children at the day-care centre. To address this problem, a Scania internal day-care centre for employees’ children might be part of the solution. Every approach which reduces the ‘need’ of flexibility might be a step closer to a future with shared means of transportation.

This work contributes to the numerous studies, aiming to understand and change travel behaviour. The results of this work are based on a single case study whose aim was to analyse ride-sharing with the framework of SPT. The test trial of this study was conducted at a department where all employees have flexible working hours. The idea was that due to flexible working hours, it would be easier for the driver and the passenger to adapt to each other. Conducting the same test trial at a department where employees start and finish work at the exact same time could however lead to a different result with possibly even more matches. Furthermore, since reaching a critical mass is essential for a successful ride-sharing system, it would be interesting to see the results of a test trial conducted with a far higher number of participants.
9. Acknowledgement

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10. References


**Personal messages**

Ulf, 58
uses car, application not downloaded
personal interview (17-03-28)

Josef, 37
uses car, application not downloaded
personal interview (17-03-28)

Robert, 33
uses car, application downloaded
personal interview (17-03-28)

Eva, 37
uses car, bus, bike, walks; application not downloaded
personal interview (17-03-29)

Lena, 49
uses SJE and commuter train, application not downloaded
personal interview (17-03-29)

Karin, 48
uses car, application not downloaded
personal interview (17-03-29)

Erik, 36
uses car, application not downloaded
personal interview (17-03-29)

Liselotte, 50
uses car, application not downloaded
personal interview (17-03-29)

Niklas, 44
uses car, application downloaded
personal interview (17-03-29)

Pär, 31
uses SJE, application not downloaded
personal interview (17-03-31)

Anna, 28
uses bus and train, application downloaded
personal interview (17-03-31)

Annika, 39
uses car, application downloaded
personal interview (17-03-31)

Anton, 39
uses SJE, application downloaded
phone interview (17-05-03)

Frida, 29
uses car, train; application downloaded
phone interview (17-05-04)
Oscar, 36
uses car, application downloaded
phone interview (17-05-08)

Laura, 38
uses car, application downloaded
phone interview (17-05-08)
Appendix 1. Research Protocol

Case study
Ride-sharing test trial for daily work commute.

Case study background
Empirical background (chapter 4)

Research question
Introduction (chapter 1)

Data collecting methods/sources
Two questionnaires and several personal interviews
Documents (previous studies, books, webpages and Scania internal documents)

Data collection procedure and history
- February and beginning of March: preparations for test trial including among others designing and printing parking signs
- March 2017: preparing first questionnaire and deciding on test area + participants
- March 13th, 2017: Start test trial/first questionnaire
- March 20th, 2017: Send out reminder to answer first questionnaire
- March 20th – 25th: preparing second questionnaire
- March 31st, 2017: End test trial/second questionnaire
- March 28th, 2017: Start personal interviews
- April 7th, 2017: Send out reminder to answer second questionnaire
- April 2017: Analyse results from quantitative and qualitative surveys
- May 3rd, 2017: First phone interview
- May 4th, 2017: Second phone interview

Ethical considerations:
- Interviewees knew they were recorded
- Interviewees knew about the purpose of the study
- Transcripts were sent back to interviewee to be approved
- Interviewees stay anonymous

Interview guide:
Appendix 4

Special preparations:
- All interviews were prebooked
- Personal interviews were recorded with a smart phone, phone interviews were recorded with a laptop

List of interviewees
Chapter 3
Appendix 2. First quantitative survey

What is your gender?
- Female
- Male
- Prefer not to say
- Other…

How old are you?
- 18-25
- 26-33
- 34-41
- 42-49
- 50-57
- 58-65
- 65+

How do you get to work?
- Car
- Public transportation (bus, train)
- Scania Job Express
- Ride-share (bilpool)
- Bike
- Walk
- Other…

Taking the car to work, how many passengers do you usually have?
- 0
- 1
- 2
- 3
- 4+
- Other…
How satisfied are you with your current commuting situation? (Likert scale)
1 (not satisfied) … 5 (very satisfied)

Which statement regarding the parking situation at Scania applies best to you?
- It is never difficult to find a parking spot
- It is sometimes difficult to find a parking spot
- It is often difficult to find a parking spot
- It is very often difficult to find a parking spot
- It is always difficult to find a parking spot

Did you ever use a ride-sharing mobile application?
- Yes
- No

I would mainly share a ride to save money. (Likert scale)
1 (false) … 5 (true)

I would mainly share a ride to save time.
1 (false) … 5 (true)

I would mainly share a ride to get to know colleagues.
1 (false) … 5 (true)

I would mainly share a ride to reduce my environmental impact.
1 (false) … 5 (true)

What would convince you to start ride-sharing?
- Free parking spots
- Financial benefits
- Lunch coupons
- If my colleagues also did it
- I would not start ride-sharing
- Other…

How open are you towards ride-sharing from a driver’s perspective?
1 (not open) … 5 (very open)
How open are you towards ride-sharing from a passenger’s perspective?

1 (not open) … 5 (very open)
Appendix 3. Second quantitative survey

What is your gender?
- Male
- Female
- Prefer not to say
- Other…

How old are you?
- 18-25
- 26-33
- 34-41
- 42-49
- 50-57
- 58-65
- 65+

Did you download the “Catchy-Ride” application during the last two weeks?
- Yes
- No

How did you use the application?
- I offered a ride
- I searched for a suitable ride
- I downloaded the application but did not use it
- Other…

In my opinion the main problem of ride-sharing is… (Likert scale)

… the loss of flexibility.
1 (false) … 5 (true)

… driving with a “stranger” (either passenger or driver)
1 (false) … 5 (true)

… being social in the morning.
1 (false) … 5 (true)

… having to rely on others.

1 (false) … 5 (true)

…other.

How often do you reflect on how your commuting habits impact the environment?
1 (never) … 8 (every day)

Do you have any suggestions on how to improve ride-sharing?

____________________________________________________
Appendix 4. Interview guide

- How do you usually get to work? (If with car: alone or together with someone?)
- Do you have a private car?
- Do you have a driver’s license? (Only for those without a car)
- Do you have a smart phone?
- Where do you live and how long does it take you to get to work?
- Do you know about neighbours who also work at Scania?

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**materials**

- What do you like, what don’t you like about the way you commute?
- Do you connect the way of commuting with environmental issues?
- How concerned are you about climate change?
- What do you think about the idea of ride-sharing?
- What are the biggest drawbacks with ride-sharing?
- Do you think ride-sharing could be a solution to reduce the number of cars at Scania?
- Do you have an idea on how to improve ride-sharing?
- Would it be a problem for you to share your ride with someone you don’t know?
- Do you have kids which influence your daily commute?
- What made you download the ride-sharing application? (To those who downloaded it)

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**meanings**

- Did you understand the concept or ride-sharing?
- Did you understand the functionality of the application? (only to those who downloaded the application)
- Do you have any experience with ride-sharing?
- Do you think it was complicated to share your ride to work? (To those who have experience with ride-sharing)