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On the Way to an Intermodal Transportation System -Improving the Cooperation in the Public Transport Sector of the Stadsregio Amsterdam/The Netherlands and the Hovedstaden Region/Denmark





Master Thesis (45 ECTS)

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MSc Sustainable Development: Environmental Governance

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I want to put this research in a perspective by quoting the current mayor of Bogotá, Gustavo Petro:

"A developed country is not a place where the poor have cars, it's where the rich use public transportation"

### ABSTRACT

A transportation system based on private car ownership and the car as a mean of masstransportation puts a high burden on public finances, the environment and the society. In order to make the transportation system more sustainable the current system has to be replaced by an intermodal system with public transportation as a backbone. In this system travelers use different modes of transport for a single trip; in order to be attractive the exchanges between those modes have to be easy, reliable and quick. In many cases, this is not yet the case. In this research project it was assumed that this is due to a lack of cooperation between the actors in public transportation.

In order to gain insights about the level of cooperation, the network structures of two public transportation sectors – the Capital Region of Amsterdam and Copenhagen, respectively – have been investigated by making use of methods derived from social network analysis and grounded theory. For the data collection 23 interviews and two workshops with transport professionals were conducted. With the information from the interviews the network structure was investigated in terms of betweenness centrality in and the power relations. By doing so, actors have been detected who might have the ability to enhance cooperation due to their central and powerful position within the network.

Furthermore, the interviews were coded in order to extract the main barriers to cooperation. The results from this analysis show that the environment within the transport sector of both regions is highly competitive. The main reasons for poor cooperation are in this regard the wrong mind-set of actors who only focus on their own business in order to maximize profit but do not consider other actors in order to increase the number of travelers in the public transport system. Due to this individualistic focus, it is also difficult for new forms of mobility to be incorporated into the existing public transport system. This mind-set is partly supported by the network structure which is based on a quasi-market. As a recommendation it is proposed to focus first on the enhancement of cooperation between the most central actors, which are in both regions the national railway operator, the transport authority, the capital municipality as well as the consumer council. Additionally, it is proposed to set up one central transport authority which is responsible to buy all forms of transport in the region. Lastly, it is important to set up one central goal that all actors have to follow which might induce a mind-set change from competition to cooperation.

Keywords: Public Transportation, Social Network Analysis, Grounded Theory, Intermodality, Sustainable Transportation, Cooperation, Transit-oriented Development, Collaborative Mobility

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## **A**BBREVIATIONS

CRA = Capital Region of Amsterdam

CRC = Capital Region of Copenhagen

TOD = Transit-oriented Development

# **1** Introduction

Just recently while sitting in a train I heard an elderly couple saying: "Well, now as we sit here it is quite relaxing to travel by train, but considering all the stress before we got in and after we got out, it would be easier to take the car again next time." This, but also my own experience has motivated me to find reasons to the question *why is the use of public transportation so complicated?* This research project is meant to find answers to this question and to provide suggestions for the solution to this problem.

#### 1.1 The Current Situation

In the last two centuries people's mobility patterns changed tremendously. Nowadays, people in the Netherlands travel on average 40km per day, whereas in the 17th century they travelled this distance in one year (Bertolini & Dijst, 2003). The reason for that lies mainly in the process of industrialization, which opened up new possibilities of transport which had an impact on the way people lived, how they lived and where they lived. The first main change took place after the invention of the railway which made it possible for people to reach working places at further distances in a shorter time than before. Also goods could be transported faster and easier. Over time, new modes of transport were developed like the bicycle, tram, bus and the car which again made travelling easier and faster for the people. Although each of the modes of transport has unique characteristics and certain advantages compared to the others, it can be said that the car has won the competition over the dominant mode of transport mode (Best, 1982; Holtz, et al., 2008).

People favor the car over other modes for various reasons: It is convenient, comfortable, powerful and gives a feeling of freedom - just to name a few (Kemp, et al., 2011; Beirão & Sarsfield Cabral, 2007; Gil, et al., 2011). Therefore, especially after the second World War, politicians, institutions and the car industry promoted car use and ownership by developing a coherent system with infrastructure and information supporting the driver (Murray, et al., 1998; Nilsson & Küller, 2000; Taylor & Ampt, 2003). Streets, traffic signs, petrol stations, parking space and garages – the car driver finds everything which ensures that he/she can reach the destination quickly and reliably. This system has been improved over the years so that car use is still increasing. As a result, the use of other transport modes has decreased so that western societies have become car dependent (Banister, 2008; Haefeli, 2005). However, extensive car use and ownership has some significant disadvantages, for instance congestion, high energy and resource consumption, negative social impacts, high costs and noise. Therefore, the existing system, which is based on individual motorized transport, can be seen as highly unsustainable (Szyliowicz, 2003; Kemp, et al., 2011; Banister, 2008; Haefeli, 2005).

As mentioned before, every mode of transport has its specific advantages. A bicycle for instance is very fast and cost-efficient on distances up to six kilometers whereas on longer distances it might be slower and too exhausting compared to motorized transport modes (Geisel, 2014). With no doubt it is, after walking, the most environmentally friendly form of mobility. In the same line, a bus is

cheaper to transport a bigger group of people whereas a car offers a more cost efficient way to transport a single person. Bearing this in mind, researchers propose to transform the current car based transportation system into an intermodal transportation system with public transportation as a backbone (Kemp, et al., 2011; Kaulen, 2013). Intermodality in this case describes a specific type of journey including several modes of transport where the interchanges between those modes are coordinated (Ezzedine, et al., 2008). It is seen as "the keystone" (Sustainable Mobility.org, 2010) and as a "necessary condition" for sustainable mobility (Szyliowicz, 2003, p. 188). In this system the advantages of each transport mode determine the travel mode choices made by the travelers and negative impacts of a certain mean of transport are be minimized (Szyliowicz, 2003). "Such a system has to offer choices, efficient conditions, coordination between modes, and cooperation between government agencies at all levels and the private sector" (Szyliowicz, 2003, p. 187). In addition to that, the objective should be "to integrate all the modes into an optimal, sustainable, and ethical system which supports efficiency, safety, mobility, economic growth and protection of the natural environment" (Ezzedine, et al., 2008, p. 282). In practice, this would mean that travelers could easily change between different means of transport in order to reach a destination and that the latter are coordinated in a way that travel time is minimized but exchanges still comfortable.

#### 1.2 Problems in Establishing a Sustainable Transport System

However, it has turned out to be difficult to transform the existing car dominated system into an intermodal system due to various reasons. In this regard Hansen (2011, p. 93ff) talks about the "value-action gap", meaning that people might have recognized that extensive use of cars has negative implications but are not willing to translate long term visions into everyday action. In addition to that, policy makers and planners might share the same interest (i.e. establishing a transportation system based on intermodality) but "cooperation and action fails because of significant differences in professional values and assumptions on how the goals should be reached" (Hansen, 2011, p. 94). Furthermore, it is difficult to change a system that has developed over such a long time and is supported by powerful actors like the car and petroleum industry, respectively.

One might argue that such a system already exists since in some cases trains, buses, car-sharing cars and rental bikes are already user-friendly (especially short ways, good information) coordinated. However, this does only apply for a few limited areas. A traveler who chooses the car for a trip can actually just steps into the car and accelerates while the infrastructure system consisting of road signs, GPS, maps, driver education programs and news of traffic conditions makes sure that he/she will reach the destination (Szyliowicz, 2003). The system is coherent in every country and very similar in western countries so that it is also easy to travel internationally by car. For the traveler using public transportation, such a system does simply not exist which makes it more complicated and time consuming (due to journey preparation time and poor coordination between means of transportation) to travel. Tariff and payment systems sometimes differ within a country and between providers so that the customer might feel lost in the search for the most cost-efficient, most convenient and fastest option to get from one point to another.

Thus, almost everybody has already experienced a situation like the old couple mentioned in the introduction. For instance Dziekan and Dicke-Ogenia (2010, p. 75) who refer to Shelley and White (2000) argue that "public transport is consigned to the 'too difficult' box in the same way as programming a video recorder". Bearing this in mind, the question "Why the use of public

*transportation is so complicated?*" asked in the beginning is highly relevant. In order to find answers to this question it is useful to imagine why the old couple would rather take the car for the next trip again. They were satisfied with sitting in the train but not satisfied with the time before entering the train and afraid of the time after leaving the train. Reasons for that might have been *physical barriers* like long ways from one mean of transportation to another, difficulties with carrying the luggage or poor weather proofing. But also institutional barriers are imaginable, like different ticket systems or the lack of information. These barriers lead to a high level of uncertainty which keeps travelers from using public transportation (Dziekan & Dicke-Ogenia, 2010; Beirão & Sarsfield Cabral, 2007).

#### 1.3 Focus of the Research Project

The transition from a car based transportation system to a more sustainable, intermodal transportation system provides enough research topics for a large group of researchers. Therefore it is useful to only focus on one particular aspect of intermodality and how this aspect can be improved. With regard to the aforementioned chapter, this aspect will be the connection points between different transportation modes, in the following named as *mobility stations*, since many problems of intermodality occur at the change from one transport mode to another. Bertolini and Dijst (2003, p. 27) see in those transportation nodes the "most intriguing mobility environments". In order to convince travelers to use more sustainable transport modes, the changes between transport modes which happen at the mobility stations have to be arranged as easy as possible.

Having set the research objects this study will focus on, namely mobility stations, the next step will be the determination of the geographical focus. In this regard, the Netherlands and Denmark have been chosen. There are mainly practical reasons for this choice, in general every region or country could have been the object of study. Firstly, the planning consultancy Copenhagenize Design Company, based in Copenhagen, Denmark, has offered its cooperation in regard to this research project. In this way, an internship of three months at Copenhagenize was part of this research project. Secondly, this consultancy works together with the planning consultancy "Mobycon" based in Delft/Netherlands which also offered its cooperation. These two consultancies were of great help in order to get in contact with relevant stakeholders.

Due to the feasibility of this research, the geographical area has to be further narrowed down. Therefore, two administrative regions with similar characteristics have been chosen. For the Netherlands this will be the Stadsregio Amsterdam and for Denmark the region Hovedstaden<sup>12</sup>. A comparison between the two regions will offer a great chance for stakeholders from both regions involved in the transportation realm to learn from each other.

#### 1.4 Outline of the Thesis Report

The remainder of this thesis is broadly divided into four parts. The following part deals with the knowledge gap in regard to the research topic and the resulting research objectives. Secondly, a methodology part was developed in order to find the appropriate way to gather and analyzes data

<sup>&</sup>lt;sup>1</sup> Stadsregio Amsterdam: 1,343,346 inhabitants, 16 Municipalities**Es ist eine ungültige Quelle angegeben.** Region Hovedstaden: 1.718.418 inhabitants, 30 Municipalities **Es ist eine ungültige Quelle angegeben.** 

<sup>&</sup>lt;sup>2</sup> In the paper the English translation for Stadsregio and Hovedstaden Regio will be used, namely Capital Region.

relevant for the answering of the research questions. The next chapter identifies variables on barriers to the use of public transportation. Thirdly, the data of the interviews were analyzed in order to identify relevant stakeholders and their relations. In the next section the data was qualitatively analyzed in order to identify the main reasons for the lack of cooperation between actors in public transportation. Lastly, a synthesis was written in order to bring the results together. The paper ends with a discussion and a short conclusion.

## 2 Knowledge Gap and Objectives

Considering the issues this research is focusing on - namely intermodality and mobility stations – it is a logical step to look first for literature in the field of Transit-Oriented Development (TOD). TOD is an approach which gained popularity especially in the USA and tries "to create livable environments where people have easy access to public transit and where transit vehicles can easily navigate" (Cunningham, 2012, p. 18). Also, it "is a strategy for reducing automobile dependence while encouraging sustainability" (Renne, 2005, p. 1). The researchers dealing with this approach are mainly from the field of spatial planning. Therefore, much has been written about how to establish neighborhoods planned according to the concepts of TOD and how to enhance the accessibility to public transportation for the citizens (Holmes & van Hemert, 2008; Renne, 2005). The authors stress the fact that cooperation especially between planners and transport authorities is crucial in order to increase accessibility. However, the question if – and if yes, why - the cooperation between actors in the public transportation realm is poor was not addressed yet by the researchers yet.

In general, research has been conducted on the improvement of intermodality by developing new mathematical models in order to improve train schedules in Denmark (Berliner Pedersen, 2005) and mainly on the improvement of freight transport (Hansen, et al., 2007; Jaržemskis & Vasiliauskas, 2007). Also in the Netherlands the focus of research on intermodality seems to be entirely on the freight transport. There has been research on the OV-Chipkaart, a contactless ticketing system which was nationally introduced in the Netherlands in 2011. However, most research is focused on the security of the system in terms of data-collection and hacking (Iwuagwu, 2009; Jacobs, 2009).

Nevertheless, this research needed a starting point which is the assumption, that there is a lack of *cooperation* between actors in the transportation realm in general, leading to the co-existence of different ticket systems, uncoordinated connections between transport modes and a lack of information for the user. This assumption is mainly based on the research of Hansen (2011) and studies conducted in Switzerland (Kaufmann & Sager, 2006), Germany (Loose, et al., 2007) and the USA (Goetz & Vowles, 2000). Although cooperation is considered as "one of the key elements in the transition towards more sustainable societies" (Lozano, 2007, p. 370) no focus has been put yet on the cooperation between actors in the transportation sector, especially in regards to public transportation. The same applies for the issue of mobility stations as a mean for intermodal mobility. Neither literature has been found which offers information on how an ideal mobility station should be designed, nor on which barriers hinder the establishment of a customer friendly public transport system.

#### 2.1 Defining Cooperation

In this research project it is all about cooperation between actors. But what does it mean actually? Cooperation can be defined as a joint action of two parties, for instance one helping the other or both being involved in a project (Tuomela, 1993). In this sense cooperation can be also seen as working together. Some researchers name it then collaboration (Lozano, 2007). In this research, collaboration is seen as one form of cooperation.

It is also a cooperation if a transport authority awards a party to fulfill a transport concession. It is not a joint action however; it is a contracted relation between the conceding authority and the concessionaire. In this project it will be dealt with both kinds of cooperation, but it is crucial to make this distinction since it has a significant influence on the research results.

#### 2.2 Research Objectives

Building on the knowledge gaps the research aims to yield:

- Descriptive knowledge by providing an overview of the actors involved in the public transportation sector in the Capital Region of Amsterdam and the Capital Region of Copenhagen
- Descriptive knowledge by analyzing the network structure between those actors
- *Explanatory knowledge* by providing reasons for the existence of institutional and physical barriers user face while using public transportation
- *Prescriptive knowledge* by making recommendation on how those barriers can be cleared and how an ideal mobility station in an intermodal transport system should be designed

#### 2.3 Research Questions

Based on the aforementioned chapter, the main research question will be:

"How can the cooperation between actors in the public transportation sector in the Capital Region of Amsterdam and the Capital Region of Copenhagen be enhanced in order to clear institutional and physical barriers that travelers using public transportation modes face especially at mobility stations?"

Based on the aforementioned research objectives the following sub-questions have been formulated in order to answer the main research question.

- Related to descriptive knowledge:
  - What are the relevant stakeholders in the Capital Region of Amsterdam and the Capital Region of Copenhagen who plan, design or making use of mobility stations?
  - How are those actors related and in what ways do they cooperate?
- Related to explanatory knowledge:

- What are the reasons for the existence of the institutional and physical barriers travelers making use of public transportation modes face at mobility stations?
- Related to prescriptive knowledge:
  - What changes have to be made in the network structure in order to facilitate cooperation between actors?
  - Which measures have to be taken in order to remove the institutional and physical barriers for travelers at mobility stations?
  - How do ideal mobility stations look like from a planners and practitioners perspective?

#### 2.4 Research Framework



#### Figure 1: Schematic Representation of the Research Framework

## 3. Methodology

This research project differs from other research projects because it cannot build on previous studies. The initial question "why is the use of public transportation so complicated?" is based on common sense; no research results were found underlying the assumption that public transportation is considered as complicated in western societies. The fact, however, that most people can tell anecdotes about confusing ticketing, insufficient service and quality, difficulties in way finding, low accessibility etc. shows that it is an issue - an issue which holds people back from using public transportation. But where are the reasons to that? On the one hand it is the travelers because they have power of demand, but they cannot be made responsible not using public transport if it is not an attractive alternative to the car or the airplane. Public transportation will never be as attractive as the use of a private car, but it can definitely be improved. Thus, this research project will investigate the supply side of the public transport sector in the Stadsregio Amsterdam and Greater Copenhagen. The supply side has the power to design public transportation in a way that it is a real alternative to the individual car.

The logical consequence of this focus for this research project is to first conduct a stakeholder analysis. As an instrument derived from social network analysis, stakeholder analysis provides an overview of all actors which are involved in the provision of public transport in Amsterdam and Copenhagen respectively. But, where to start? There is no website or book which offers this information. Usually, the company who runs a certain modality is named on the mean of transport. That gives a first indication whom to contact to find out more about the network's structure. But there are more aspects in a network besides the actors itself. One of them is their connections. Who pays whom and who is in contact with whom? Who is collaborating with whom and who can tell somebody what to do? Those are relevant questions. To get the corresponding answers, though, is rather difficult since the actors in public transportation are usually rather large entities and it is not easy to get an interview with the right person. Therefore it needed the contact to somebody who is familiar with the sector and is well connected with the different actors.

Another problem which had to be dealt with is that this is research project does not fit in the category of research projects in which hypotheses are formulated based on literature which are then proven through the research. This is due to the fact that little has been written on cooperation between actors in public transportation as mentioned in <u>Chapter 2</u>. Research has been conducted on the aspects which are important to make public transportation attractive for the traveler, but not on the reasons why improvements are not or only very slowly happening. This is what should come out of the interviews with the different actors.

Bearing in mind that the actors had to be first identified and that it was not possible to formulate hypotheses this research project *grounded theory* was considered as an appropriate approach to

answer the research questions. In the following this approach will be discussed and also the extent to which this research project can be designated as a grounded theory.<sup>3</sup>

#### 3.1 Grounded Theory

#### 3.1.1 In general

Grounded theory was first introduced by the sociologists Barney Glaser and Anselm Strauss with the book "The Discovery of Grounded Theory: Strategies for Qualitative Research" (Glaser & Strauss, 1967). In an interview with Heiner and Barbara Schervier-Legewie, Strauss himself said that grounded theory is rather a methodology and style to think analytically about social phenomena than a method or a set of methods (Strauss, 2004). It is about generating social theory (Krassen Covan, 2007), it must explain not only describe "what is happening in a social setting" (Holton, 2007, p. 272), but "there is no agreement on what constitutes a grounded theory" (Dey, 2007, p. 173). It is more "philosophy" than a theory (Krassen Covan, 2007, p. 66). This fact points actually to the main problem, that scientists who are intended to apply the concepts of grounded theory face, since it can be everything and it can be nothing. A guideline on how to do a grounded theory does simply not exist (Holton, 2007; Dey, 2007).

In this sense, grounded theory cannot be considered as a theory like e.g. new institutionalism or network theory are. Those theories provide a way of viewing and at the same time a set of methods to analyze certain phenomena. In new institutionalism this is for instance the institutional analysis and development framework (IAD-Framework) or in network theory the social network analysis (SNA). After deriving hypotheses about how the phenomena under scrutiny emerged they can be tested by applying the just mentioned methods. This way is common in research: the two methods, IAD-Framework and SNA, define a "practice for a community of researchers" which brings along "the possibility of extremely precise research" (Klee, 1996, p. 135).

Grounded theory however does not offer such methods. Also, it is not about deductively deriving hypotheses – it is actually about inductively collecting and simultaneously analyzing the data (Krassen Covan, 2007). Hence, Glaser and Strauss see the collection and the analysis of data not as different processes (Glaser & Strauss, 1967). Another important difference is that grounded theory "requires the researcher to enter the research field with no preconceived problem statement, interview protocols, or extensive review of literature" (Holton, 2007, p. 269). The researcher has to be as open as possible to discover the "substantive area and allowing the concerns of those actively engaged therein to guide the emergence of a core issue" (Ibid, p. 269). Furthermore, it should not be set how the data will be collected (Ibid).

In sum, the researcher has a great extent of freedom when doing a grounded theory, but the various guidelines and interpretations of it can be "opaque and confusing" (La Rossa, 2005, p. 838). The data collection can be done by any qualitative means – may it be interviews, workshops or surveys with open questions. As said earlier, the data collection and analysis are seen as one process. Thus, the

<sup>&</sup>lt;sup>3</sup> Due to the lack of existing literature related with this research, it has been decided to not include an explicit theoretical chapter in this research project. However, Chapter 3.1 and Chapter 4 can be seen as the compensation for this decision. Chapter 4 alone would be however too short for a theoretical chapter, and Chapter 3.1 rather belongs to the methodology than to theory.

analysis starts at the point when data collection has begun, namely by taking memos. In the grounded theory literature this first means of analysis is called memoing.

#### 3.1.1.1 Memoing

"Memos are records of the thoughts and feelings and ideas and insights that you have along the way when you are undertaking your research" (Birks, 2012). It is important to distinguish memos from field notes, since memos are "records of observation" and rather subjective whereas field notes are rather records of what has been said and objective (Birks, 2012). According to Glaser, "the writing of theoretical memos is the core stage in the process of generating grounded theory. If the researcher skips this stage by going directly to sorting or writing up, after coding, she is not doing grounded theory (Glaser, 1978, p. 83). The added value of memoing is guiding the researcher in the data collection (Holton, 2007). Furthermore, that it help to conceptualize the data which is important in regards to the second crucial aspect of grounded theory, namely coding.

#### 3.1.1.2 Coding

The same as memoing, also coding is seen as a core process in grounded theory (Holton, 2007; Dey, 2007; Krassen Covan, 2007). It is a mean of handling great amounts of data and filtering the information. There are two types of coding: "Substantive coding, which includes both open and selective coding procedures, and theoretical coding" (Holton, 2007, p. 265). In open coding, the researcher analyzes the data "line by line" (Krassen Covan, 2007, p. 68; Holton, 2007). The advantage of line by line coding is that it forces the researcher "to verify and saturate categories" and that the risk of missing an important category is minimized (Holton, 2007, p. 275). Other scientists and Strauss himself argue, that there is no need to go through every single sentence in the collected data (Strauss, 2004). This shows again disunity and that Dey (2007, p. 172) is right when stating "there is no agreement as to the appropriate set of coding procedures to adopt." Anyhow, the researcher has to analyze the data in a way that is appropriate from his own perspective in order to find patterns in order to put the information in core categories. Questions which can guide the open coding process are e.g.: "What category does this incident indicate?; What is actually happening in the data?; What is the main concern being faced by the participants?; What accounts for the continual resolving of this concern?" (Glaser, 1998, p. 140) Still, it is sometimes not easy to assign certain indicators/codes (incidents in the data under analysis) to one category since they might belong in more than one. "For example, not all birds fly, and not all creatures that fly are birds" (Dey, 2007, p. 169).

The categories should be, however, not descriptive. They should represent a certain concept instead, since in the end it is concepts which matter for a grounded theorist (Holton, 2007). Holton (2007, p. 272) illustrates that by using an example: If the three indicators "boosting self-confidence, growing as a person and learning to trust" are found in the data they will not serve as a category, but will all fall under the concept of "empowerment". Thus, the goal is to develop abstract concepts. Here, the researcher should not look too much into detail (Ibid). In the end it is the probability statements about the relationship between concepts which can be seen as the results of a grounded theory (Ibid, referring to Glaser, 1998).

#### 3.1.1.3 Constant Comparison and Theoretical Sampling

While assigning the incidents to the categories, one has to constantly compare the incidents to each other in order to "establish the underlying uniformity and varying conditions of generated concepts

and hypotheses" (Holton, 2007, p. 278). The procedure of *selective coding* and comparing has to continue "until the process yields the interchangeability of indicators, meaning that now new properties of dimensions are emerging from continued coding and comparison" (Ibid, 278). That point is called theoretical saturation.

It has to be considered that the coding process starts right after the first data collection and usually the researcher does not know in advance where the next data collection will take place. The process in which the decision about what data to collect next and where to find it is called theoretical sampling. Here, the scientist follows the theory as it emerges (Holton, 2007). This shows the philosophy of a grounded theory. The researcher sees a social phenomenon and tries to figure out why it emerges. This shows that grounded theory is a suitable approach for this research project.

On the way to an explanation he/she is guided by the hypotheses which emerge from the data collection. The hypotheses evolve and change from (e.g.) interview to interview. Based on them, the researcher decides who to ask next for information. It is really the theory which structures the research process and not the researcher.

#### 3.1.2 To what extent is this grounded theory?

Bearing the aforementioned in mind the question comes up if this research project can be considered as a grounded theory. Generally it is relatively difficult to do a grounded theory since the practitioner wants to know before starting the research "how the research should be framed, who should be engaged, and what outcomes should be anticipated." Furthermore, "this instinctual practitioner perspective is, as well, frequently augmented by the structuring dictates of predominant research paradigms which call for the articulation of explicit theoretical frameworks in advance of fieldwork or analysis" (Holton, 2007, p. 270; Partington, 2002). This call was also relevant for this research project.

The first point which is in line with the grounded theory literature is that the research project was started without an extensive review of literature (because of the lack it). Still, to do a grounded theory it needs "a clear purpose, one or more research questions, a theoretical perspective and an outline research design" before beginning collect, code and analyze data (Partington, 2002, p. 138). All of this was covered in the research proposal. The point that there should not be a preconceived problem statement, however, allows discussion. Yes, there is a problem statement which explains why this research has actually been started: Public transport is complicated to use. And there is also an assumption that this is maybe due to a lack of cooperation between the different actors in the public transportation sector. But there were no more problem statements concerning the supply side in public transportation which would allow the development of hypotheses which then could be tested. It is not known yet which processes or phenomena "behind the scenes" hinder the establishment of an easy-to-use and well-connected transportation system.

In addition to that, the coding process has been done the exact same way as explained in the grounded theory literature. First an open coding process in order to develop core categories - each represents an abstract concept. An example for this is the concept mind-set representing an abstract concept; competition is then seen as a category belonging to the concept of mind-set. In the following step, the data was selectively coded line-by-line and the codes were put into the categories until the categories were saturated.

On the other hand, memoing was not done exactly in the way it was described in the literature. It was not done in a written form but of course the researcher kept certain thoughts and feelings from the interviews in mind. These memos were taken into account in the analysis. Also, the search for the next source of information was not entirely guided by the hypotheses which were developed after each interview. Sometimes an interview partner was chosen just because another interviewee said it would make sense to have an interview there.

In the end it is important to ask for the goal of this research. That is to investigate the supply side of the public transportation sector in the region of Amsterdam and Copenhagen, respectively, and to find solutions to the problems which hinder the improvement of the transport system. It is, however, not to develop a conceptually integrated theory which is the value that Holton (2007, p. 268) sees in grounded theory. Still, the approach which has been chosen to find answers to the research questions is very much in line with the grounded theory methodology.

#### 3.2 The Interviews

Apparently, the interviews constitute the core of this research project. The goal was to cover a variety of actors in the regions under study in order to achieve an objective overview of the cooperation of the actors and the problem which exist in this regard. Naturally, it is not possible to talk about objectivity if not all actors were asked. But it can be said that through the variety of interviews and the workshops it has been tried to reduce subjectivity. In order to get the information which was necessary to answer the research questions, it is crucial to ask the right questions to the interviewees. Six questions have been developed which served as the basis for the interviews. Those questions have been asked in most interviews.

In the beginning of each interview, after an introduction to the project, it has always been asked which background and what responsibilities the interviewee has. This was important in order to understand where the expertise of the particular person lay. Furthermore it was asked what exact responsibilities the interviewee's company/institution has. The following two questions were then directed at the cooperation between actors. It was asked with which actors the company/institution is in contact with and with whom it cooperates. In addition to that it was asked where the problems in the cooperation with other actors lie.

Lastly it was asked how –from the interviewee's perspective - an ideal mobility station would look like and what is most urgent to be improved for the customer. In general, these questions lead to relevant information but they rather served as a starting point for a conversation. The intention behind these very openly formulated questions was to give the interviewees freedom to answer without guiding them already in a particular direction. It has to be considered that every interview had a different structure due to the different backgrounds and positions of the interviewees. Naturally, other questions will be asked in an interview with a bus operator compared to one with a researcher from a university. And again other questions were asked to a representative from the consumer association. The most relevant information was gathered through the answers to questions which came out of the conversation.

Afterwards, each interview was transcribed manually. Usually every word said was written down; only in a few cases, information was left out since it was not related to the topic in any way. In a next

step the information was coded by making use of the methods which were introduced in *Chapter* 3.1.1.2.

#### 3.3 The Coding Process

The coding of the interviews was done after all interviews were conducted. First, all transcribed interviews were examined in an open coding process by making use of the program *NVivo*. Here categories were built serving as a basis for the following network analysis. Examples for these categories are cooperation with other actors, statements about the bicycle or statements about mobility stations (the full list can be seen in *Chapter 5*). With this information it was possible to draw the networks and to see the differences between the organization of public transport in Denmark and in the Netherlands. Also, this open coding process served to detect the core concepts their subcategories behind the interviewees' statements. These served as a basis for the second coding process, the selective coding.

In this process, the subcategories were filled with codes. Every sentence and statement was constantly compared to the categories. During the process more categories were built. If a new category came up, the information which was investigated already had to be analyzed again in order to see if some parts belong to the new categories. In this way the data and the categories have been constantly harmonized until the categories were saturated.

The intention in the coding process was to establish the same conceptual structure for both cities. This helps to make the two cases comparable. Furthermore it has to be said that after reading trough the interviews from Amsterdam, the awareness was already focused on certain problems. Therefore the interviews from Copenhagen could not be coded with an "empty mind", meaning that one looks automatically for the same problems in the other case. This is a natural bias. But it has been tried to keep this bias as low as possible. The same applies to the interviews in general. Every interview influenced the next interview which followed. And the information gathered in Amsterdam influenced the interviews which were conducted in Copenhagen. This is in one way good but in one way also a disadvantage.

On the one hand it is good that there is more information from interview to interview the interviewees can be confronted with. This is the prerequisite for rich research results. One the other hand, some problems might not become apparent due to the focus on aspects which were mentioned before. However the questions were developed in a way to minimize the chance for this kind of bias.

#### 3.4 Social Network Analysis

After the coding process, the data gathered with the first open coding process was analyzed by making use of research methods derived from the explanatory sciences, in particular from network theory. Coming back to the old couple example mentioned in the introduction it is interesting to see which and how many actors were involved in the provision of services they made use of in order to reach their destination. There might have been a taxi company or a bus company which brought them to the train station. At the train-station they made use of the building and its facilities and then entered a train, operated by a certain company. The situation was probably similar when they left

the train. In fact there are even more actors involved in the provision of public transportation services, like car sharing and bike rental companies as well as planners and consultancies.

However, the aim of this research was not only to identify relevant stakeholders, but also to investigate their relations and the resulting network. In this regard the founding idea of network theory is that networks, and their structural properties, affect the qualities of collaboration processes and, therefore, should be perceived as important variables in the search for explanations about success and failure with regard to the improvement of mobility stations in terms of intermodality (Wassermann & Faust, 1994; Rowley, 1997). Furthermore, network theory investigates how the social structure of relationships around a person, group, or organization affects beliefs or behaviors (Sandström & Rova, 1969). The relations are displayed in a network consisting of nodes (network members) and edges which tie the nodes (Wassermann & Faust, 1994). A network analyst considers these networks as "the primary building blocks of the social world" and takes therefore a "fundamentally different perspective" than researchers focusing "on individualist or attribute-based perspectives" (Marin & Wellman, 2011, p. 11). A particular challenge in this regard was to decide which nodes should be part of the network and which ones should not be part of it. In order to tackle this challenge, a combination of a relation based and a position based approach has been favored.

#### 3.4.1 Approaches for actor - detection

The *position based approach* considers all actors who have a formally defined position within the network. In the case of public transport this might be a transport authority or a contracted operator. Using only this approach would however leave out other actors like car sharing operators or consumer associations. Therefore, also the *relation based approach* was considered, which "begins with a small set of nodes deemed to be within the population of interest and then expands to include others sharing particular types of relations with those seed nodes as well as with any nodes previously added" (Marin & Wellman, 2011, p. 12). Sometimes it was still difficult to decide if an actors should be part or not, for instance in the case of research institutes. In the end they were left out since it was not feasible to get information from all actors about cooperations with research institutes. Even if there are projects of an institution/company together with universities, many employees within the particular institution probably do not know about it since they might sit in another department which is not part of the project.

#### 3.4.2 Roles of actors

The relations which were discovered through the interviews can be of various kinds: Information flows, knowledge exchange, particular projects or other forms of collaboration. Within these relations there can be different types of interaction for instance helping, speaking with or giving orders (Marin & Wellman, 2011). In the networks created based on the interviews, the type of relation/interaction is not visible. There is simply an edge with a direction between two nodes. The direction is indicated since it is important to see who initiates a contact to another actor. This tells something about the power of an actor to induce a change in the organization of public transport. In the same line, it is of great interest which actor is centrally placed within the network. In this regard, *network centrality* refers to an actor's position within the group of actors; "centrality and leadership status are often, but not necessarily, correlated" (Lansford, et al., 2009). Centrality can be divided in 1) *degree centrality* which is how easily an actor can reach any other actor in a network by relying of shortest distances in the network graph (Hagedoorn & Duysters, 2002; Newig, et al., 2010;

Golbeck, 2013). For this research, degree centrality and betweenness centrality were calculated with the program *Gephi*.

Role	Description
Star	An actor who is highly central in the Network
Liaison	An actor who has links to two or more groups that would
	otherwise not be linked, but is not a member of either
	group
Bridge	An actor who is a member of two or more groups
Gatekeeper	An actor who mediates or controls the flow (is the single
	link between one part of the network and another)
Isolate	An actor who has no links, or relatively few links to others

 Table 1: Roles of Actors (van Laerhoven, 2013)

Additionally, based on the centrality of each actor, the roles of actors in the network can be described (van Laerhoven, 2013). Here, a name was assigned to each actor based on the calculations on betweenness centrality. The reason for this is simply that names are easier to grasp compared to numbers. In the process of assigning names to the actors, also the statements about an actor's decisive, financial and initiative power which were gathered in the coding process were taken into consideration. An example illustrates this methodology: An actor which scores high in terms of betweenness centrality but does not have much power in any sense – like 9292OV – will not get the label of a star actor. In this way relevant insights into the network structure of the public transport sector in the capital regions of Amsterdam and Copenhagen can be provided and changes can be proposed in order to enhance the level of cooperation between the actors.

#### 3.5 Mediated Modeling

The combination of various research methods, namely interviews, social network analysis and methods derived from grounded theory is meant to uncover the barriers to good cooperation within the public transport realm. The intention of this research project is however not only to uncover problems, but also to find solutions to those problems. Normally, it is only the student who comes up with such solutions. In this project however, also the professionals were part of this process. In order to include them into the research project beyond the interviews, workshops have been organized based on the mediated modeling method.

Mediated modeling emerged in system dynamics and builds on the *group model building* literature (Antunes, et al., 2004). This method seems to be perfectly suited to investigate the institutional barriers hindering the development of customer friendly mobility stations. The advantages of this method are that it firstly helps to capture the knowledge in the mental models of the client group, secondly to increase the chance of the implementation of the research results and thirdly to improve the collective learning processes (Vennix, 1999, p. 379). Antunes et al. (2004) suggest that two to four workshops with 5-12 participants should be conducted during the research process. In this research project, it was possible to organize two workshops.

#### 3.6 Data Collection

Data has been gathered in several ways. The main data sources for this research project were the 23 interviews which have been conducted with the stakeholders in Copenhagen and Amsterdam. But there were also several events during the research period which gave valuable input. At first there is the internship at Copenhagenize Design Company where issues dealing with intermodality belong to the daily business. The company is for instance involved in an EU Project which is called BiTiBi<sup>4</sup> (Bike Train Bike). It is supposed to improve the connection between bikes and trains and the kickoff meeting took place in Utrecht during the research period. For two days professionals from several countries were discussing at that event about barriers and opportunities to intermodality especially in regards to trains and bicycles.

Furthermore, the World Congress on Collaborative Mobility took place in Bern during this study and can be seen as a valuable source as well. Finally, there was the Regiodag on the 23<sup>rd</sup> of May 2014 where the Stadsregio Amsterdam presented itself to their municipalities. During this conference there were several workshops which gave insight in the needs concerning public transport of the municipalities forming the Stadsregio. Finally, the workshops which were organized provided more insights into the respective situation within the CRC and the CRA and can be seen as a measure to increase the validity of the research results.

<sup>&</sup>lt;sup>4</sup> Detailed information about the project can be found on <u>http://www.bitibi.eu</u>

# 4. Barriers to the use of Public Transportation

This research project is mainly about developing solutions together with professionals which might help to foster the cooperation between actors in public transportation. Furthermore, it will be discussed how an ideal mobility station should be designed. However, due to time constraints it is not possible to involve the travellers themselves in the process, although it is of great importance to know what the customers of public transportation actually desire. In this regard a relevant question is what would convince the old couple mentioned in the beginning to use public transportation also for their future trips? In an ideal situation this question would be the benchmark for every actor involved in the public transportation realm. However, the answer to this question is not easy, since every traveller is different and has different demands (Hensher & Reyes, 2000). The car industry can and does react to those different demands. The manufacturers follow the wishes of the customers and offer different products to meet a range of different demands. Most of the time a basic product is offered and the buyer can customize the product as he/she likes. Money is not an issue as long as the customer is willing to pay it.

Public transportation is different. It is not possible to customize public transport, apart from the different classes which exist in some modes. Also, the institutions and operators cannot always consider the demands of the traveller since they are dealing with public money and have to look for the costs. As a consequence, the individual preference is better served by commuting by car, since it is more convenient, more flexible and sometimes faster (van Vugt, et al., 1996). For the public transport realm it is not possible to compete with private car ownership in this regard (Hensher & Reyes, 2000). Another factor which poses a significant challenge on public transportation operators is that travel mode choices are not rational (Beirão & Sarsfield Cabral, 2007; Davidov, et al., 2002). People love to drive and to have the control (Beirão & Sarsfield Cabral, 2007). A train or bus operator will never be able to satisfy this demand. Additionally, travel mode choices are rather habitual and habitual behaviour is difficult to break (Dziekan & Dicke-Ogenia, 2010). Therefore it becomes a key challenge to organize that people travel in a more sustainable way (Gehlert, et al., 2013).

There are however other barriers to public transport which can be addressed. By doing so, public transport would become significantly more attractive. To investigate these barriers, a literature review has been conducted. Here, most articles which were chosen are part of the psychological research realm. Furthermore, relevant insights could be gathered through the interviews with the professionals, the internship at Copenhagenize Design Company and the participation in the Congress of Collaborative Mobility 2014. Lastly, the Regiodag 2014, organized by the Stadsregio, served as a good source. At this event, workshops were conducted with representatives from the 16 municipalities which are part of the Capital Region of Amsterdam. In those workshops, the representatives (public transport users themselves) were asked about their demands and suggestions in regards to the public transport system. In this way, a variety of sources has been covered in order to overcome the fact that travelers were not involved in this study. The results of this research will be presented in the following.

Gil et al. (2011) argue that speed, comfort, punctuality and the absence of alternatives are reasons for the extensive use of cars. All those factors can be addressed by actors of the public transport sector. Trip chaining plays an important role in this respect since it has an impact on all three aspects

which were just named. Hensher & Reyes (2000, p. 341), for instance, state that "a particularly important policy implication of trip chaining is the potential barrier it creates in attracting car users to switch to public transport". In addition to that, "research of Arriva has shown that if you have to exchange your travel mode for two times you lose up to 60% of your passengers" (W1, 2014). One solution would me more direct connections. However, more direct connections are in many cases less efficient because they oftentimes overlap with other lines. An example for that are regional busses coming to centers of larger agglomerations, like Copenhagen or Amsterdam. At the beginning they drive on different routes whereas at the end - when approaching the final destination which is mostly a larger train station – they share their routes. In this case it would be more efficient to end the bus routes at an earlier point so that the travelers can reach the center by means of transport with a larger capacity, like tram or metro (van Drooge, 2014). Here, the dilemma between convenience and efficiency becomes obvious.

In a system based on intermodality, the traveler has to deal with interchanges between modes. "As a consequence, the reliability of connections between vehicles is a key issue for the attractiveness of the intermodal transportation network and it is strongly affected by some unpredictable events like breakdowns or vehicle delays" (De Giovanni, et al., 2008, p. 762). This circumstance negatively affects the feeling of certainty of the traveler. Beirão and Sarsfield Cabral (2007) and especially Dziekan and Dicke-Ogenia (2010) highlight the importance of certainty in regard to the use of public transport. Thus, one reason for negative attiudes against public transportation are "the feelings of uncertainty that travellers experience" (Dziekan & Dicke-Ogenia, 2010, p. 73). In the interviews and in the first workshop several professionals mentioned the fact that travellers feel "left alone" if a connection is missed due to a dealy. The travellers do not get the feeling that they are taken care of (W1, 2014; 106, 2014). Travellers want to have assistance in case of a delay and they want to have an alternative offered instead of just waiting for the next train/bus connection (W1, 2014). In general, the traveller wants to have access to all possible modes of transport. Also to new forms like carsharing, bike-sharing or peer-to-peer offers (Regiodag, 2014; WoCoMoCo, 2014).

However, the traveller does not only want have access to all possible alternatives, he/she also wants easy access to it (I01, 2014; I02, 2014; Regiodag, 2014; W1, 2014). Different ticket systems, different designs or complicated registration processes hinder people from using public transport. The traveler is not interested in different designs; he/she just wants to reach the destination in a fast, cheap and cost efficient way (I02, 2014; I11, 2014; Regiodag, 2014). Therefore he/she wants all services "out of one hand" and is not interested in competition (I03, 2014; Weibel, 2014; Regiodag, 2014). In this regard, the concept of "one stop shopping" is promising. Here, the traveler has one interface for purchasing tickets or accessing information even if there are various actors involved in the service provision (I02, 2014; I04, 2014).

Also the total travel time plays a crucial role (van Vugt, et al., 1996; W1, 2014). Usually, institutions and operators advertise the travel time between two stations especially if it is comparable short compared to the travel time needed when using a car. But if the stations are not close to the point of departure/destination, the traveler spends significantly more time travelling than advertised (Copenhagenize.com, 2014). In order to enhance the accessibility more consideration has to be assigned on the entire time the traveler needs from door to door. The part from (departure) door to station and from station to (destination) door, are the two parts of the journey which are relatively the most time consuming (Banister, 2008).

In addition to that the various means of transport have to be better coordinated since oftentimes a significant amount of time is spent on waiting for the arrival of the next part of the journey-chain. The car has in this regard a clear advantage (Banister, 2008). Murray et al. (1998, p. 327) point out, that in order to enhance accessibility public transport stops should be 'personalized', meaning that the user has the chance to choose between various means of transport like "taxi, multiple fare taxi, a mini bus on a flexible route or a conventional bus" at the stop. This approach goes along with significant costs, therefore the personalisation of some very frequented stops would already increase the utility for the users.

Another important variable determining if people feel comfortable while using public transport is the level of information provided since information reduces uncertainty (Dziekan & Dicke-Ogenia, 2010; Beirão & Sarsfield Cabral, 2007). Dziekan & Dicke-Ogenia (2010) highlight in this sense the concept of the (continiously changing) cognitive map every traveller has in mind. This map has to be supported all along with information about direction of the mean of transport, its route, possible connections and delays so that the traveller can "keep track" on his journey. Ideally, this happens in real time using the available technologies. However it has to be taken into account, that the traveller can only process a certain amount of information. Also the way it is presented is important. Therefore, the design of information and information supplies must be developed from a travellers point of view (Dziekan & Dicke-Ogenia, 2010; Gehlert et al., 2013).

Variable	Additional Information	Sources
Reliability	The reliability of connections and information; Availability especially in regards to bike- and car- sharing;	(De Giovanni, et al., 2008; Dziekan & Dicke-Ogenia, 2010; Beirão & Sarsfield Cabral, 2007; W1, 2014; 106, 2014)
Accessibility	Public transportation access point within short distance; Access to shared modes within short distance; No complicated registration processes; The traveler wants to have the choice between different modes of transport;	(Regiodag, 2014; WoCoMoCo, 2014; I01, 2014; I02, 2014; W1, 2014; W2, 2014; Murray, et al., 1998)
Central Coordination	Everything "out of one hand"; "one stop shopping"; Single check in/check out; Coherent design and ticket systems;	(I02, 2014; I03, 2014; I04, 2014; I11, 2014; Regiodag, 2014; W2, 2014)
Travel Time	The traveler wants to cover a distance as quick as possible; Short waiting time at an exchange point;	(Copenhagenize.com, 2014; Banister, 2008; Gil, et al., 2011)
Information	Real-time Information; Centrally available; Information about alternatives in case of a breakdown/delay;	(Dziekan & Dicke-Ogenia, 2010; Gehlert, et al., 2013; Beirão & Sarsfield Cabral, 2007; I02, 2014; I03, 2014; I06, 2014; I11, 2014)
Costs	Reasonable ticket prices;	(I02, 2014; I11, 2014; Regiodag, 2014)

Table 2: Variables affecting the attractiveness of public transportation

In order to provide clarity, table 2 summarizes the barriers to the use of public transportation. In sum it can be said that reliability, accessibility, central coordination, travel time, information and the costs are important variables the actors in public transportation have to improve in order to convince more people to use public transport instead of the private car. The variables are interdependent. If for instance due to high ticket prices user numbers stay low also the availability of connections and modes will be low. Also, informing travelers about delays does not necessarily satisfy them. In addition to sufficient information they need access to an alternative in order to be able to reach the destination in time. This shows that improvements on one variable are only partly useful if the other variables are not improved at the same time. It needs a holistic perspective in order to make public transportation more attractive. New kinds of cooperation have to be established based the travelers' demands; also the design of mobility stations has to follow these aspects.

## 5. Stakeholder Analysis

As mentioned earlier, a stakeholder analysis was conducted in order to generate "knowledge about actors – individuals and organizations – so as to understand their behavior, intentions, interrelations and interests" (Varvasovszky & Brugha, 2000). In this chapter, the relevant stakeholders of Amsterdam's and Copenhagen's capital regions will be presented and their role within the respective transport network will be described. In this regard it is usually difficult to set boundaries. Who is in the network and should be considered and which actor should be not considered? The main criterion to choose the actors was therefore that they must be somehow involved in the provision of public transport within the administrative region under study. Excluded were the fields of production and maintenance, meaning that bus/train manufacturers as well as construction and maintenance companies were not considered. That does not mean that they do not play an important role in the provision of public transport, but due to the limited timeframe choices had been done with the result that the focus has been on all actors financing, organizing and running public transport services. Also because those can have a more immediate impact on the experience of the traveler since infrastructure and products are rather difficult and costly to change.

*Figure 2* and *5* provide an overview of all relevant stakeholders and their connections to each other. The figures are built on the information which was given by the interviewees and were complemented where necessary with information provided on the actors' websites. The result shows a complex network in both, Copenhagen and Amsterdam. A connection between two actors has been drawn when there was a financial dependency, a formal cooperation or collaboration. However, the two figures do not indicate what kind of connection exists. That will be shown in figures presented at a later point. They only serve for an overview. In the following each network will be described and the main differences between the two systems will be outlined.

#### 5.1 Stakeholders in the Capital Region of Amsterdam

In the Netherlands, tax collection is done on a state and on a municipal level meaning that the municipalities have their own budget independent form the state. On a regional level however, the provinces do not collect money from the citizens, they get a certain budget assigned from the state. With this budget the provinces fulfill various tasks, for instance the provision of certain bus-lines. In the case of region around Amsterdam this is the province Noord-Holland, which covers in total 53 municipalities. Within the province there is another administrative level, which is the Stadsregio Amsterdam (Capital Region of Amsterdam) covering 16 municipalities including the city of Amsterdam. Its main function is to provide the public transport within these 16 municipalities.

Since many public transport modes cross administrative borders the province and the Stadsregio have to cooperate on certain bus-lines. These two institutions do not own any busses or other means of transport, they do the tendering and development of concessions. Currently three companies are running the busses, trams and metro-trains in the region, namely the GVB, Connexxion and EBS. The Stadsregio is divided into four concession areas out of which two are served by Connexion, one by the GVB (City of Amsterdam – largest concession in the Netherlands in terms of passenger volume) and one by EBS.

The tenders of the Stadsregio do not include trains. Only a few lines in the Netherlands are part of a tendering process. All other train-lines are operated by the national railway company NS. In the Stadsregio trains are exclusively operated by the NS. The tracks on which the trains run however are not owned by the NS, but by the company ProRail. The stations are partly owned by the NS, partly by ProRail. Furthermore, the national bicycle rental scheme OV Fiets and the Taxi product Zonetaxi belong to the NS. Both services are also available in the Stadsregio Amsterdam. There is a cooperation between the parking company Q-Park and the NS as well (I17, 2014).

It is also relevant for this study is that there is a nationwide ticketing system in the Netherlands: the OV Chipkaart. It was introduced nationwide in 2011 and functions with a contactless smartcard. Trains, busses, trams, the metro, OV Fiets and the Zonetaxi are included in this system. All money goes to the joint venture TransLinkSystems which is responsible for collecting the money and distributing it again.

Furthermore there are several other modes of transport available, especially in the City of Amsterdam. There are three car sharing companies active: Car2Go, ConnectCar and Greenwheels. The last one is included in the OV Chipkaart systems as well. Furthermore there are several bicycle rickshaw offers and the regular taxi services. Lastly there is the travelers association Rover with the goal to increase service quality in the public transportation sector. Fig ... shows the network of the Stadsregio Amsterdam. The various connections between nodes do not help the readability of the network, but the intention of that figure is another: It gives the reader an immediate impression of actors which are more central and of those which are less central in the network.



Figure 2: Stakeholders in the Capital Region of Amsterdam

#### 5.2 Organizational Structure in the Capital Region of Amsterdam

#### 5.2.1 Transport Policy Actors CRA

In order to understand the existence and non-existence of relations between actors it is important to look at the organizational structure of the entire sector and also of the individual actors. Furthermore the funding structure is relevant in this regard since one actor financing another means usually also a certain degree of power over its decision making process. The actors were divided in groups following Spit's suggestion to distinguish between transport policy actors and logistic actors (I20, 2014). Transport policy actors are in this regard institutions or authorities which are responsible for the planning and financing of public transport. They however do not run any means of transportation. Logistic actors are then the operators actually transporting people to their destination.

*Figure 3* shows however that it is not always possible to divide the actors only in two groups. A distinction has been made between public logistic actors, public/private logistic actors which significantly differ from the first group due to several reasons and the third group, private logistic actors. This will be further explained in the following abstracts.

At first there is the taxpayer in the group of transport policy actors. All institutions behind the organization and planning of public transport are indirectly financed with his/her taxes. Indirectly means in this sense that the taxes always go to one institution and are distributed to other institutions/authorities. The taxpayer does not directly pay any transport institution. However he/she has the power to guide transport policy into a certain direction by voting in elections. Since elections taking place on a municipal and on a state level the transport policies can differ from city to city and from city to state. A result might be that municipalities trying to decrease car use within cities whereas the state facilitates car use by extending highways.

Interesting institutional layers where interests might clash are the provinces and the Stadsregios, which are on the same level (I18, 2014). On this level the planning and organization of the municipal public transport takes place. Here, municipalities, provinces and Stadsregios have to cooperate. Provinces and Stadsregios have more power than the municipalities in decision making (I18, 2014). Their budget consists of money which is assigned to them from the national government and provinces collect also particular taxes for instance the motor vehicle tax (Rijksoverheid, 2013). These two institutions are responsible for the organization and planning of the public transport on a regional and municipal level. The interviews indicate that there are several voices criticizing that the Stadsregio Amsterdam and the Province Noord-Holland exist next to each other with sometimes overlapping tasks (I18, 2014; I19, 2013).

Also the municipalities, depending on their size, have certain obligations in terms of public transport. They are involved in the spatial planning and also decide where and how often the bus and tram lines are running. In the City of Amsterdam there are four departments somehow involved in public transport which can be seen in *Figure 4*. This structure itself requires a great degree of cooperation between the departments which is not yet the case (I12, 2014).

One institution which does not really fit in this scheme but still appears in the column of transport policy actors is Rover. This travellers association does not finance or organizes any public transport

service but it is asked for advice in governmental decisions on public transport (I11, 2014). Therefore they have the power to steer certain policies. Rover is financed by its 6000 members and gets subsidies from the Dutch government as well (Ibid). In the interviews Rover was considered as a useful and powerful addition to the public transport landscape (I11, 2014; I18, 2014; I16, 2014; I22, 2014).

Lastly one actor which is included in *Figure 3* but not in *Figure 2* is the city district. There are eight of them in Amsterdam and they count as one actor to not overcomplicate the scheme. They are not involved in the organization and planning of public transportation – that is the reason why they do not appear in *Figure 2*. Planning and organization is the duty of the Stadsregio and the spatial planning department of the Municipality of Amsterdam. But still they have a certain degree of autonomy. They can for instance apply for funding from the Stadsregio to organize projects on alternative public transport – as the district Amsterdam Nieuw West does. Just recently they started a project with small electric vehicles (*GOGO*)<sup>5</sup> which are driven by unemployed people and meant to offer an alternative to busses and trams for short distances. This new system is not incorporated in any way to the existing public transport system (I13, 2014).

#### 5.2.2 Public Logistic Actors CRA

The logistic actors have to be divided in three different groups. The first group is the public logistic actors. In the past the large actors in this category were state or municipal companies. In the beginning of the 1990s, however, there was a trend to privatize those businesses in Europe in order to make them more efficient. Following this trend, the Dutch national railways were organized as a private company but all the stakes in that company are owned by the Dutch Government. Therefore, the NS is still considered public. The same counts for ProRail. It is a result of the separation between rail operation and rail infrastructure. The company has the same structure and owner as the NS. OV Fiets and NS-Zonetaxi are counted in this category as they are subsidiaries of the NS. The structure of the NS can be seen in detail in *Figure 4*. Also the GVB (*Gemeentelijk Vervoerbedrijf*) is listed in this category since it is the same case as with the national railways. It was previously a municipal, public company and was converted into a private company with all stakes at the municipality. The curiosity about this fact is, that the GVB was the only company in the area of the Stadsregio getting a concession without going into competition with other companies (I18, 2014).

#### 5.2.3 Public/Private Logistic Actors CRA

This category consists of actors where the boarders between public and private are blurry. EBS (*Egged Bus Systems*) for instance is a bus company which won the concession for Waterland and is owned by the Israeli cooperative Egged. It acts as a private company in the international market but is in fact a cooperative owned by its members (Egged Cooperative, 2014). Also Connexxion is a case where it is not clear if it is entirely private or public. That is because it is owned by the French public transport company Transdev, which is again partly (French) state owned (Reuters, 2014). This complex structure is one result of the deregulation of the European public transport market where more and more previously state owned companies are privatized and operating internationally (Meyer, 1997).

<sup>&</sup>lt;sup>5</sup> More information on the alternative transport project GOGO can be found on: <u>http://www.nieuwwest.amsterdam.nl/@742065/24-mei-feestelijke/</u>

The third actor in this category is the car-sharing operator GreenWheels. It is mostly considered as part of the NS because the car sharing cars are allowed to have the NS Logo on it and can be used with the OV Chipkaart. It is however owned by a private company, namely Pon Holding (I22, 2014).

#### 5.2.4 Private Logistic Actors CRA

In this category all the actors are listed which are offering public transport services and are entirely privately organized. These are the public taxis, the cars-haring cars of ConnectCar which are owned by a car rental company called KAV Autoverhuur, the car-sharing cars of Car2Go which are owned by the German car manufacturer Daimler and finally around 400 bicycle rickshaws (*fiets taxis*) which are available in the City of Amsterdam (I15, 2014). The company TransLinkSystems is not listed in this scheme because it is neither a policy nor a logistic actor. It is owned by the four largest transport operators of the Netherlands and can be seen as a facilitator for the payment (TransLinkSystems, 2014; I14, 2014)



Figure 3: Types of Actors in the CRA





Figure 4: Organizational Structure of NS, Amsterdam Municipality, DSB and Copenhagen Municipality (only departments relevant for transportation)

#### 5.3 Stakeholders in the Capital Region of Copenhagen

The picture in Denmark and the Capital Region of Copenhagen is in many ways similar to the Dutch situation. Taxes are collected by the municipalities and by the state. There is a separation between the Danish Railways (DSB) and the rail-infrastructure owner Banedanmark. In the Capital Region it is only the DSB which is operating trains. The commuter train network S-Tog belongs to it as well. Besides that, the DSB has a contract with the recently introduced bike sharing scheme GoBike (I05, 2014).

Responsible for the bus services in both, the Region of Zealand and the Capital Region, is the transport authority Movia. The same as the Stadsregio Amsterdam, they do not own any busses. They do the tendering and give out concessions. Another difference to the Dutch system is in this regard that Movia tenders the busses line by line. The busses have all the same color (yellow) and the name of Movia written on it very dominantly. The name of the particular operator is only written in a corner on every bus next to the entrance door. In the Netherlands the busses have different colors according to their operators and the name of the Stadsregio is not presented to the traveler. By far the largest operators in the capital region are Arriva and Citytrafik. Then there are several smaller, mostly local, bus companies.

Similar to the Netherlands there is a common electronic ticket system, the Rejsekort. It is currently being implemented nationwide. This will change the tariff structure since it is now still possible for the traveler to by one ticket for a particular zone and use within this zone every mode of transport (trains, busses and the metro). With the Rejsekort a certain amount will be deducted for each trip in accordance to the transport mode used. Bus og Tog is the company responsible for the introduction of the Rejsekort.

The Metro of Copenhagen is different to Amsterdam not incorporated into a concession but an independent actor. Besides that there are two car sharing operators active in Copenhagen, LetsGo and Hertz Delebilen, and of course public taxis.


Figure 5: Stakeholders in the Capital Region of Copenhagen

#### 5.4 Organizational Structure in the Capital Region of Copenhagen

#### 5.4.1 Transport Policy Actors CRC

The organizational structure (see *Figure 6*) in the Danish transport sector is very similar to the Dutch structure, but again there are some significant differences. Also in Denmark, tax collection is done by the State and the municipalities. The regional layer in administration is however not as powerful as in the Netherlands. The regions do not collect any taxes. They get funded mainly by the Danish state and partly by the municipalities (103, 2014). Their main task is public health care but also mass transport. In the case of the CRC however the organization of public transport is done be the transport authority Movia. It covers both, the Capital region and the region Zealand. Movia, which can be seen as a Stadsregio with a limited scope of duties, is owned by those two regions and by all the municipalities in the two regions. This means that it is owned by 47 different actors (109, 2014). Movia is only responsible for bus services in the CRC and Zealand and does in this regard the detailed planning, the timetables and the daily work (I02, 2014). The overall planning and coordination lies at the municipalities. The same as the Stadsregio Amsterdam, Movia is responsible for the tendering of the bus service. Different to the Netherlands it is not done in concession-areas; the tendering process is done line by line. Line 5 in Copenhagen might be operated by one operator whereas line 6 is operated by another. Within the City of Copenhagen<sup>6</sup> there are two departments involved in the public transport realm, namely the department for finance and the department for technical and environmental issues. Smaller municipalities usually do not have staff which is exclusively working with public transport (I02, 2014).

Another actor which is not yet very influential within the public transportation domain is the Danish Consumer Council. There is however currently a project of the council together with the ministry of transport to establish a travelers association similar to Rover in the Netherlands or Passenger Focus in the UK. Since the project is supported and even initiated by the ministry of transport, the association might gain influence in public transport once it is established. Finally, a company which does not exist in the same way in the Netherlands, is Bus & Tog Samarbejdet (*"The Bus & Train Cooperation"*) which is owned by all transport authorities and the train operators of Denmark. In this institution "all work is based on agreements between all the PTAs and the cooperation is voluntary" (Bus og Tog, 2014).

#### 5.4.2 Public Logistic Actors CRC

The situation with the railways is the same as in the Netherlands. The rail operation is separated from the infrastructure and both companies (DSB for trains, Banedanmark for the network) are privatized. The Danish state owns 100% of the stakes. Also the commuter trains in the Copenhagen region (S-Tog) are operated by the DSB however under its subsidiary company DSB S-Tog. As mentioned before, the DSB is also involved in the new bicycle sharing scheme GoBike. Besides the

<sup>&</sup>lt;sup>6</sup> Throughout the entire paper, the City of Copenhagen is considered as the City of Frederiksberg *and* the City of Copenhagen together. Formally this is not correct, since the City of Frederiksberg is an independent municipality. It is however completely surrounded by the City of Copenhagen and is therefore considered as a one city district. The only reason for this approach is to simplify the figures and the analysis.

Danish Government the DSB provided the main source of funding to install the new system. It is supposed to be introduced in entire Denmark yet it is only available in the City of Copenhagen and Frederiksberg. It is possible to use the bikes with the Rejsekort. Nevertheless it is clear that the DSB does not offer door-to-door solutions (covering the entire travel chain) as the NS does in the Netherlands. The DSB would like to offer door-to-door solutions but the political will to back this strategy up is not existing (I01, 2014).

The Copenhagen Metro is, contrary to Amsterdam, independent from the transport authority and other operators. It is owned by the City of Copenhagen (50%), the Danish State (42%) and the City of Frederiksberg (8%). The operation itself is done by the Italian company Ansaldo (I02, 2014).

#### 5.4.3 Public/Private Logistic Actors CRC

The only means of transport in the CRC which is not owned by the Danish public is the bus. As mentioned before, bus lines are tendered and bus companies can go into a competition with other bus companies in order to get a concession for a line. There are several bus operators active in the CRC, the number ranged in the interviews from 12 to 20. It was not possible to get the exact number. This is however not of great importance. More important is to understand the general structure of the organization.

Many bus operators are small to midsize businesses. They are counted in the category private logistic operators. Only the two biggest ones, Arriva and Citytrafik, belong to large multinational companies which are again state owned. Arriva is a subsidy of the German railways operator DB and Citytrafik is a subsidy of the French company Keolis; this is again a subsidy of the French railway operator SNCF. Both, DB and SNCF, are state owned. Therefore, they are counted in this category, although they act as private companies on the market. Lastly there is LetsGo, a cars-haring operator which is also active in the CRC and organized as a cooperative.

#### 5.4.4 Private Logistic Operators CRC

The same as in the Netherlands the public taxis belong in the category of the private logistic operators. Furthermore there is the largest car sharing operator in the Copenhagen region, which is Hertz Delebilen, in this category. It is owned by the American car rental company Hertz.



Figure 6: Types of Actors in the CRA

# 6. Quantitative Analysis of the Networks

Building on the overview of the two public transport sectors that the previous chapter provided, an analysis of the networks follows in regards to the degree and the betweenness centrality of each actor. The degree of an actor displays the number of actors it is connected with whereas betweenness centrality "measures how often a node appears on shortest paths between the nodes in the network". This definition was taken from the program *Gephi* that was used to calculate the values and to display the networks. It has to be mentioned that the degree was counted bidirectional whereas the betweenness centrality was calculated mono-directional. An example shows the reasoning behind this strategy: If a car-sharing operator asks the municipality for parking licenses for their cars it is one connection directed to the municipality. If there is however a project where carsharing operator and municipality join forces in order to increase the use of car-sharing within the city there will be two connections: One directed to the operator and one directed to the municipality. It is very important to represent the direction of the edges in this regard. However, if betweenness centrality is calculated it does not matter from which direction the connection comes. It is only relevant that there is a connection. Building on this, an actor with a high value for betweenness centrality has many actors within direct reach around.

#### 6.1 Network of the CRA

*Figure* 7 shows the network of the CRA created with Gephi. The size of the nodes indicates graphically the value of betweenness centrality of the respective actor. The larger the circle the more direct connections the actor has. The edges are directed with arrows and show if a connection exists only because one actor initiated (single sided arrow) it or if both of the actors initiated the connection (double sided arrow). The latter can be considered as a joint action as mentioned in the car-sharing example in the previous abstract. The single sided arrow stands for giving orders or asking for permissions. The justification for each connection is explained can be found in *Annex* 1.



Figure 7: Network of the CRA based on Betweenness Centrality

Label	Degree	Betweenness Centrality
City of Amsterdam	19	62,80
NS	19	32,82
Stadsregio Amsterdam	15	20,50
Other Municipalities	16	18,52
TransLinkSystems	8	14,96
Dutch State	12	8,18
GVB	5	5,39
Rover	10	4,63
Taxi	3	2,83
Province Noord-Holland	12	2,79
NS-Zone Taxi	3	2,54
9292OV	4	1,67
GreenWheels	5	1,37
OV-Fiets	3	1,37
ProRail	8	1,17
Taxpayer	6	1,17
EBS	4	1,15
Connexxion	4	1,15
Car2Go	1	0
Rickshaws	1	0
ConnectCar	1	0

Table 3: Results of the Calculations on Betweenness Centrality for the CRA

*Figure* 7 and *Table 3* show that the transport policy actors and the public logistic actors are very central to the network of the CRA and cooperate on a high level. Most of the time it is not voluntary cooperation but joint action that is obligatory due to legislation. In station development for instance many actors have to cooperate since they share different responsibilities at a station. One actor owns the ground around the station (municipality), another is responsible for the service areas in the station and the building (NS) and another one is responsible for the rail infrastructure (Prorail). In these cases the employees of the different institutions/companies are in contact on a regular basis and know each other well. The same applies for route and traffic planning. Here, the Stadsregio, the province, the municipalities and the NS are frequently in contact.

Evidently, the City of Amsterdam is the most central actor in this network. Why does this actor score so high in terms of betweenness centrality?: because it is in *between* most of the other actors. That is the basic concept behind betweenness centrality (Cook, 2014). If actors want to reach other actors they have to go most probably via the City of Amsterdam when taking the shortest path. Other actors like ConnectCar, Car2Go or the Rickshaws have a betweenness centrality of zero because no actor has to pass through their node if it wants to reach another actor (Ibid.). On the other hand it has to be considered that some results are misleading. The Taxi for instance appears more central than the bus operators for instance. This is only because they are directly connected to the municipalities, which are highly central to the network and connect a quite isolated actor with others, namely NS-Zonetaxi. The bus operators are also in contact with the municipalities but for the operation of public transport the Stadsregio is in this regard the only relevant contact for the

operators. Still, in reality they have a much more central position than the taxis which are only in contact with the municipalities and NS-Zonetaxi for operational purposes. Also TransLinkSystems appears to be central whereas this actors does not have any decisional power. It only facilitates the payment process but is of course in contact with all operators and the state. Therefore it scores high but is actually not relevant.

In general however, the results match significantly with the qualitative analysis of the interviews. The NS is central to the network because it offers all transport modes within the company. The Stadsregio is highly central since it is the main actor behind the organization of the bus-, tram-, and metro-transport in the CRA. Therefore, the NS and the Stadsregio Amsterdam are the most important actors in terms of transport operation. The City of Amsterdam links these two actors with many other operators. Interestingly is that Rover does not have a high value in betweenness centrality but is linked to all main institutions and operators within the Stadsregio. This is also indicated by the degree of ten, which is relatively high compared to most other actors. It is obvious that the actors who actually operate means of transport are not very central to the network. Furthermore private actors are very isolated.

#### 6.2 Network of the CRC



Figure 8: Network of the CRC based on Betweenness Centrality

Label	Degree	Betweenness Centrality
City of Copenhagen	19	49,98
Movia	14	41,40
DSB	15	32,87
Danish State	17	26,19
Rejsekort A/S	9	12,46
Other Municipalities	13	11,39
Danish Consumer Council	8	8,51
Rejseplanen	7	7,76
GoBike	5	3,77
Metro	6	3,42
Citytrafik	4	2,13
Arriva	4	2,13
Other Bus Operators	4	2,13
Capital Region	9	1,52
Bus og Tog	3	1,07
DSB S-Tog	4	0,51
Region Zealand	4	0,25
Taxpayer	6	0,2
Banedenmark	8	0,2
LetsGo	5	0
Тахі	2	0

Table 4: Results of the Calculations on Betweenness Centrality for the CRC

*Figure 8* and *Table 4* show the same type of information as the two figures before but for the CRC. The general picture is not very different to the CRA. Also in Copenhagen and its region, private actors are relatively isolated. Furthermore, the largest municipality is again the most central actor: The City of Copenhagen (including the City of Frederiksberg). The DSB has the same position in terms of betweenness centrality as the NS in the CRA, however in case due to different reasons. They do not offer a variety of transport modes as the NS does; but they operate for instance the commuter train service S-Tog within Amsterdam. Furthermore the DSB is in frequent contact with the Metro and all other institutional actors within the CRC.

The Danish State is relatively more involved in the operation of public transport in the CRC compared to the Dutch State in the CRA. It partly owns the Metro and is therefore directly involved in the operation of public transport within the City of Copenhagen. In Amsterdam, the Stadsregio manages all bus, tram and metro traffic in the whole region. The state is only responsible for the train transport. In Copenhagen the situation more separated. Also here, the transport authority has a high degree and scores high in betweenness centrality. It is however, only responsible for bus transport. Here it becomes obvious that the results could easily be different if for instance Arriva and Citytrafik would have not been counted separately but under the title of "other bus operators". Then, the degree of Movia would have been lower and also its value in terms of betweenness centrality. However, Arriva and Citytrafik have been counted as separated actors for good reasons. The companies they belong to (*see Chapter 5.4.3*) are multinational operators and not comparable to other medium sized, local bus operators. Also by taking into consideration that Arriva will start in mid-end 2014 with its own large-scale car-sharing program, it makes sense to count them as

separated actors. These companies have totally different financial opportunities as the smaller bus operators and can start such projects. Therefore it is important to map which contacts they share.

Also in the CRC actors appear central which have in reality no important position within the network if it comes to decisive of financial power. Rejseplanen for instance, the same as 92920V, appear to be quite central – what they certainly are. But compared to the Capital Region which is less central they are less important due to their mandate. The same as the companies behind the chip card systems they can be rather seen as facilitators.

Lastly, the Danish Consumer Council has, the same as Rover, many connections; but it does not have power yet, since the legislation to establish a travelers-council is not yet passed. In the future however, it will certainly be an important actor within this network with the power to induce change.

#### 6.3 Groups of Actors

Considering the results of the network analysis and the qualitative information gathered it is possible to put the operators and authorities into groups. The first group consists of the operators which belong to the national train companies which get their mandate directly from the state. The second group of actors consists of the bus operators which get their mandate from the transport authorities. In the case of Amsterdam, also tram and metro services belong to this group. In Copenhagen, the Metro is a special case because it is neither under control of the national railways nor is it under control of the transport authority Movia. Lastly, there are the private actors like car-sharing operators, taxi or alternative transport services. They do not get a mandate in order to operate. They are however under control of the respective municipality which is responsible for giving out all kinds of licenses necessary for the operation of such a service.



The constellation of the three groups can be seen in Figure 9 and Figure 10.

Figure 9: Groups of Actors CRA



#### Figure 10: Groups of Actors CRC

In order to make the exchanges between modes of transport easier it is of great importance that those three groups are very well connected. The central actors - which are the capitals of the regions, the national state, the transport authority and the national rail operators - are working together already, but they do not work on the integration of the modes they are responsible for.

#### 6.4 Roles of Actors

Based on the results of the calculation on the networks, a role can be assigned to each actor in accordance to *Table 5* and *Table 6*. The following table displays these roles for the actors in the CRC and the CRA, respectively.

Label	Role	Justification
City of Amsterdam	Star & Bridge & Liaison	Highest level of Centrality, Links to all three groups. Powerful in terms of legislation
NS	Star & potential Bridge	High level of Centrality, Linking all actors from the NS group.
Stadsregio Amsterdam	Star & potential Bridge	High level of Centrality, Links to all bus, tram and metro operators. Financially very powerful
Other Municipalities	Star	High level of Centrality, but due to the small size of the municipalities compared to Amsterdam less powerful
TransLinkSystems	Star	Central to the Network but only facilitating role for ticket revenues
Dutch State	Star & Bridge	Central to the network, but much less compared to CRC. Very powerful especially in regards to legislation.
GVB	Star	Central to the network because of the large mandate compared to the other operators. Owned by the municipality.
Rover	Star & potential Bridge	Central to the network, plays an important role in representing travelers' needs.
Тахі	Isolate	Few links
Province Noord-Holland	Star	Central to the network, but not very important in terms of public transport operation. Rather important in regards to infrastructure.
NS-Zone Taxi	Isolate	Few links, but well incorporated into NS system
9292OV	Potential Bridge	Crucial role in information exchange, but not powerful. Cannot enforce cooperation.
GreenWheels	Isolate	Few links, but incorporated into the NS system

Label	Role	Justification
OV-Fiets	Isolate	Few links, but well incorporated into NS system.
ProRail	Isolate	Few links, important for development of mobility stations.
Taxpayer	Isolate	Few opportunities to directly influence the system
EBS	Isolate	Few links
Connexxion	Isolate	Few links, experienced in small scale transport
Car2Go	Isolate	Few links, financially powerful owner
Rickshaws	Isolate	Few links
ConnectCar	Isolate	Few links

Table 5: Roles of Actors CRA

Label	Role	Justification
City of Copenhagen	Star & Bridge & Liaison	Highest level of Centrality, Links to all three groups. Powerful in terms of legislation
Movia	Star & potential Bridge	High level of Centrality, Links to all bus operators. Not very powerful.
DSB	Star & potential Bridge	High level of Centrality, Linking all actors from the DSB group.
Danish State	Star & Bridge	High level of Centrality, not linked to all groups but highly influential in legislation. Very powerful.
Rejsekort A/S	Star	Central to the Network but only facilitating role for ticket revenues.
Other Municipalities	Star	Central to the network but due to the small size of the municipalities compared to Copenhagen less powerful
Danish Consumer Council	Star & potential Bridge	Already central, although no mandate yet. Can play an important role in the future.
Rejseplanen	Potential Bridge	Crucial role in information exchange, but not powerful. Cannot enforce cooperation.
GoBike	Isolate	Less central, but well incorporated into DSB system
Metro	Isolate	Only operating in the City of Copenhagen, few links
Citytrafik	Isolate	Few links, but highly experienced and financially powerful owner
Arriva	Isolate	Few links, but highly experienced and financially powerful owner
Other Bus Operators	Isolate	Few links
Capital Region	Isolate & potential Bridge	Few links, but potential facilitator in terms of cooperation
Bus og Tog	Isolate	Linking public operators, but not powerful

Label	Role	Justification
DSB S-Tog	Isolate	Few links, but well incorporated into DSB system
Region Zealand	Isolate	Few links, not very important for Capital Region
Taxpayer	Isolate	Few opportunities to directly influence the system
Banedanmark	Isolate	Few links, important for development of mobility stations
LetsGo	Isolate	Few links, but project with Movia
Taxi	Isolate	Few links
Hertz Delebilen	Isolate	Few links

Table 6: Roles of Actors CRC

Assigning a role to each actor is very useful considering the groups which have been established in the last chapter (*Chapter 6.3*). It shows for instance that the capital municipalities of each region have a high potential to enforce cooperation between the three groups. Only these actors are linked to all three groups and can be therefore considered as Liaison actors (for description of roles see *Table 1* in *Chapter 3.4.2*). Furthermore they are star actors among many others. In both networks there is a high number of star actors, meaning that they have a high degree of betweenness centrality. The actors in the networks are either central to the network or very isolated with only a few links to others. Additionally, some actors can be considered as bridge actors since they have the potential to bring other actors, which would not be connected without them, together.

# 7. Qualitative Analysis of the Network Structure

This chapter can be seen as the core chapter of this research project as it will outline the analysis of the interviews which have been conducted between December 2013 and May 2014. In total that is 22 interviews. The interviews were based on the questions which were developed beforehand and mentioned in <u>Chapter 3.2</u>. The interviews were all personal with one exception via Skype. They all have been transcribed (Annex 2) in order to analyze them with the methods mentioned in <u>Chapter 3.3</u>. The interviews have been analyzed at the same time, but in a separated coding process. This means that there is coding file for the interviews conducted in Amsterdam and one for the interviews from Copenhagen which can be found in the Annex 3.

In the following, the abstract concepts are explained and the content of the codes which were assigned to the respective subcategories is outlined. Additionally, at the end of a description of a main concept, the findings are summarized in a table.



#### 7.1 Mind-set

#### Figure 11: Coding Structure Concept Mind-set

*Figure 11* shows the coding structure related to the first overarching concept which was addressed in most of the interviews, namely a wrong *mind-set* among employees of a certain actor or within the entire company/institution. If the mind-set is not based on cooperation it can be assumed that this factor also hinders the cooperation between actors. Below this concept there are three nodes which stand for a certain mind-set. One of them is *competition*. It refers to the fact that many respondents mentioned that they are not working together with other actors because they see them as competitors. There can be competition between actors (*external competition*) and competition within a company/institution (*internal competition*). Since different measures are needed to change these two paradigms they are separated into two sub-nodes. Furthermore there is one sub-node

named *market*. Here, statements are gathered outlining the attitude of respondents towards the market principle within the public transportation realm.

The other two main categories which belong to the concept mind-set are named *fear* and *intermodality*. The latter refers to the mind-set of employees or the entire company/institution towards intermodality. The statements which were collected in this sub-node outline if actors see themselves as a link in the transportation chain or rather as independent actors focusing on their own business. Lastly the sub-node fear refers to the fact that interviewees mentioned in many interviews a certain kind of fear towards change. No one said that directly, but some statements imply that this mind-set can hinder the development of an intermodal system with easy exchange points. In the following the results from this analysis will be presented for the CRA and the CRC.

#### 7.1.1 Competition

#### **External Competition**

There is one good example from the CRC which shows the problem of external competition (I05, 2014) which was also confirmed by the people participating in the first workshop: If a person usually takes the bus and the train to work, the money has to be divided by the bus operator and the train operator (which is in the CRC always the DSB). If however this person starts using now one of the bicycles of the recently introduced bicycle sharing scheme GoBike instead of the bus all the money of the trip goes to the DSB since they have a contract with GoBike. Therefore, "there is a great incentive for the DSB to steal the customers from the busses because if they use a bike instead of the bus they double their income" (I05, 2014). This shows on the other hand that there is no incentive for the bus operators in the CRC to work together with GoBike.

In addition to that, the income share is always a difficult thing. "There is a hell of a discussion going on [how to divide the income] and they sue each other" (I02, 2014). Another interesting fact is that the Metro Copenhagen did research on the impacts of a new bicycle sharing scheme on their operation. The result was that especially on sunny days the Metro would lose passengers and therefore money, since it is paid per passenger (I04, 2014). Also the bus operators are paid per passenger. The passenger numbers are counted with a sensor technique installed at the doors of the particular means of transport. Therefore, actors do not only see new actors coming into the market as competition, but also established ones. Some planners for bus transport see for instance the Metro as a competitor although figures show that "if there is more people in the Metro then there is also more people in the busses" (I09, 2014). This shows as well that there is no incentive for the different companies to promote each other or to cooperate.

Sometimes even the institutions and authorities see each other as competitors. Planners and civil servants do not want be told by others what to do:" There is a special Danish mind-set. Don't think you know more than me. We can manage our own" (I02, 2014).

In the CRA the picture is not very different to the CRC. Bus providers do not pass information from other bus providers "because it is competition" (I11, 2014). Some consider bicycle use in general as a competition for the public transport system (I11, 2014), an aspect that also counts for Copenhagen since it was mentioned in the workshop. Also the new system (*GOGO*) which is established in one district in Amsterdam, where small electric vehicles should offer an alternative transport form for short distances, is considered as a competitor for the established taxi companies. Whereas the project managers of GOGO see other forms of public transport as a competition since they will only

be able to continue with their project if there is enough passengers using it (I11, 2014; I13, 2014). Apparently this is a competition about financial resources. It can be also found on the institutional level (since in the case of GOGO, Amsterdam Nieuw West acts as an operator) for instance between the Province of Noord Holland and the Stadsregio Amsterdam. Since their responsibilities overlap to a certain degree both actors are competing for the money they get from the national government (I18, 2014).

In general, the competition between actors becomes obvious in the planning of *mobility stations* since every actor wants to have the best spot, which is mostly the closest point to the railway tracks (I22, 2014; I21, 2014). This leads to long negotiation processes if something new is planned (I01, 2014) which is a barrier to short term changes in order to make exchanges between modes easier. Interestingly, only two interviewees (I18, 2014; W1, 2014) mentioned explicitly that they see the car as a competitor.

The situation is different if the actors belong to one company. The interviews with the Dutch Railways showed that the products they offer are not set up to compete with other products from the company, but to add to them. All these products –trains, busses, shared bikes, taxis and shared cars, parking – are organized under the *door-to-door* strategy of the NS. Here, the focus is to shorten the travel time the customer needs from the door of his/her starting point until the door of the destination. Furthermore the goal is to have easy exchanges between the different modes (I17, 2014; I21, 2014; I22, 2014). Also the Danish National Railways would like to offer all these products to its customers but a lack of political will inhibits this (I01, 2014). This cooperative door-to-door focus was not mentioned by any other institution or operator.

In sum it can be said that the actors in general, but particularly the operators in both public transport sectors, the CRA and the CRC, are in a highly competitive relation. This is politically intended. The politicians in both countries, Denmark and The Netherlands, want to have competition between the operators since it is supposed to lower the costs for the operation of public transport and it stimulates innovation. No one was able to provide numbers on the savings this competition brings but everybody was convinced that there are benefits.

This competition should not have negative side effects for the customer. It should happen "behind the scenes" since nobody wants to have a competition on the road where the customers can chose for instance between different bus companies (I03, 2014; I11, 2014; I18, 2014). Bearing the aforementioned information about the competition in both public transport sectors in mind, it is however very likely that it has consequences for the customers.

#### Internal Competition

The internal competition refers to the different interests or mind-sets between employees or branches within one company/institution. Since it is very likely that people try to advocate their own way of thinking and their interests there is a probability for a competition between different people, even though they belong to the same company/institution. In the interviews this situation was mentioned mostly within larger actors like municipalities or state owned operators. In the Municipality of Copenhagen for instance there are two departments responsible for public transport, the financial and the technical-environmental department (*Figure 4* in <u>*Chapter 5*</u>) and they have equal status when it comes to a decision. Since both departments might have different interests, the local government has to decide in the end and "that goes really bad" (I02, 2014). In the Municipality

of Amsterdam there are even four departments in some way responsible for the public transport and "often it is not a common way to work with each other" (I12, 2014). The same accounts for the railway system in both regions. There are several parties within the organizations (*NS and DSB*) whereby infrastructure and operation are separated. "And everybody has its own interest" (I21, 2014). This shows that parties rather try to push through their interest instead of working together.

#### Market

In this category the interviewees' opinions about the economic focus within the public transportation sectors will be now presented since it is useful to see which benefits/drawbacks a system working with market principles has especially for the customer.

At first it can be said that this is a controversial issue. When people who are working in the sector were asked about the benefits and the disadvantages they reacted mostly in a way that the interviewer got the impression this question should have not been asked. The overall feeling was that the market principle should not be questioned since it has only benefits. But no one could come up with resilient data to prove that circumstance. Therefore the overall impression coming from the interviews was that the market principle has many positive effects. At first monopolies are considered as slow, expensive and not innovative (I14, 2014; I18, 2014; I12, 2014). Furthermore, a public transport system based on market principles is supposed to reduce costs because it is organized in a more efficient way. "The idea was also that if you have a market based mechanism, also the revenues would be better" (I18, 2014; I09, 2014). Only one interviewee was explicit on where the savings come from: "There is a great deal of competition between those companies. So they lower the prices of their drivers. It is a big cost" (I09, 2014).

The other advantage of a market based system is that it should stimulate innovation. Due to the fact that companies are competing they are forced to be better than the respective competitor with the result that they try to be more innovative than the others. This however does not really apply for the public transportation system of the CRA and the CRC. The reason is that there is only competition when the concessions are given out. After that the company gets the contract for a certain amount of years (it depends on the concession giver and the concession itself). In the car-industry for instance, manufacturers have to be constantly innovative. If they fail in this aspect the might lose customers immediately. In the public transportation sector however, the companies do not have incentives to do more than what is demanded from the contract (I05, 2014; I20, 2014; I11, 2014).

The transport authorities in the CRC, Movia, and in the CRA, the Stadsregio, realized that and are now trying to force the operators also during the concession period to work more customer oriented and to be more innovative. They work very much with bonuses and penalties. That means that if a company does not fulfill certain standards it has to pay a penalty. If a company however performs better they will get a bonus. In the Stadsregio Amsterdam these bonuses are given out based on a customer satisfaction survey (I18, 2014). If an operator scores well in this survey it gets a bonus which can result in a six-figure sum. This can be seen as an incentive for the operators to perform better, although the operators already plan with the bonuses beforehand. Furthermore they are can raise their income if they have more passengers since after a certain threshold in the number of passengers, the money goes directly to the operator.

Movia also uses this strategy in the CRC to incentivize the operators to perform better. In the beginning, when Movia stopped owning their own busses and the system was turned into a market

based system, the bus operators were paid by hours of operation. The consequence of this system was that "the less passengers, the easier their [Movia's] life was. Less maintenance, less cleaning and they got the same amount" (I02, 2014). Some years ago, Movia changed the system and started to pay per passenger. Furthermore they started working with penalties and bonuses. Through these measures the service quality increased significantly. The operator Arriva started with one bus line where the drivers were trained to provide better service and driving. Also they provided the passengers with free internet. The result was that within two years the passenger numbers on this line increased by 30% (I02, 2014; I03, 2014; I09, 2014). On the other hand, paying per passenger increases the competition between modes which might have negative effects for the customer, as mentioned earlier. This development shows, that the authorities are working on adjustments to organize public transport in a way that is more customer oriented.

The analysis shows that operators will only be more customer-oriented if they are either forced to fulfil certain requirements which are demanded by the authorities or if they get a monetary incentive. That the companies act in this way is just natural, since in a market based system their main focus is to maximize their profits (I20, 2014). One aspect however does not fit into the relatively new paradigm of privatization and competition: Only parts of the transportation services which are ordered by the authorities are part of a tender. Train services in the CRC and the CRA are still handled by the national railways in a monopolist manner. Also the concession for the City of Amsterdam was not part of a tender since the Dutch government created the option of direct awarding for the four largest cities in the Netherlands. Therefore the Stadsregio Amsterdam directly awarded the GVB to continue the operation of the busses, trams and metro without forcing them to take part in a competition (I18, 2014). Bearing this in mind, the system is not built in a fair way since it advantages certain actors.

#### 7.1.2 Fear

The second main category under the concept of mind-set is fear. It is probably not a category someone would expect in this respect but in many interviews a certain feeling of fear was observable. Already the last point mentioned in the previous abstract can be counted into this category. It can be assumed that the option of direct awarding was created due to the fact that politicians were simply not brave enough to let the largest concession of the Netherlands (which is the City of Amsterdam) be part of a tendering process. It would have been a big change if the GVB lost the competition and apparently some people are afraid of large scale changes. A reason for that is that those kind of organizational changes usually mean that it is about people's jobs (I18, 2014). This means of course that some people would be against it.

It was also quite noticeable that the Stadsregio Amsterdam was by the time when the interviews were conducted in a situation where its existence was under question. This is due to the fact that the Stadsregio is a "kind of strange government layer between those [provinces]" (I12, 2014). The national government is aware of this fact and is trying to change the structure (I19, 2013). Therefore, in the interviews and at the Regiodag the Stadsregio put a surprisingly high emphasis on self-promotion. One interviewee mentioned for instance that there is a discussion to change the structure in the CRA because there are too many layers "but at the same time they [the government] noticed that we [the Stadsregio] are doing a lot of good work" and "the municipalities are very pleased with the way we [the Stadsregio] are working" (I18, 2014).

Another reason why actors are afraid of a change in the structure might be the risk to lose responsibilities. In the CRC for instance there was the proposal to create one central transport authority which could buy all transportation services. This would have had the result that some of the planning capacities would have been taken away from the DSB, from Movia and the Metro. Due to this fact resistance rose and therefore the suggestions of the proposal were not implemented (I03, 2014). In addition to that, the actors are afraid that others have access to their data about passenger numbers and customer satisfaction (I06, 2014; I16, 2014; I14, 2014). Especially the operators do not want to be transparent in regards to their data since they do not want to give other actors, which might be their competitors in the next tender, access to it (I18, 2014).

In general it can be said that the actors involved in public transport are not really open to structural changes which would enhance cooperation between them so that the traveler would benefit. Many see the problems but they are not willing to tackle them at the source (for instance overlap of responsibilities, lack of information exchange). On the other hand, consultants and researchers which are not directly involved in the operation of public transport are promoting structural changes (I03, 2014; I20, 2014).

#### 7.1.3 Intermodality

Based on the last two abstracts it can be said that the current mind-set within the public transport sector of the CRC and the CRA is not facilitating cooperation and change but rather to maintain the status quo. "[...] You tell everybody you want to integrate, but essentially what they are saying is that the other ones should adjust" (I20, 2014). Apparently this is not a good precondition if it is about converting the current transportation system into a customer focused, intermodal system. But what do people working in the sector actually think about the idea of an intermodal system and where do they position themselves in this system? This question will be answered in this category.

Owning a car means mobility for the owner. A car can fulfil almost every travel demand and it can reach almost every place in an easy and convenient way. If somebody does not own a car this person usually has to take several modes of transport to reach the destination. And as mentioned earlier, the ones offering a certain transport service have to work together with other suppliers in order to create easy exchanges for the traveler. Therefore there are several voices saying that the people working in the public transportation sector should not only think about the mode of transport they are responsible for but rather in terms of mobility (102, 2014; Kaulen, 2013; 103, 2014; 104, 2014). The one actor which comes closest to this mind-set is the Dutch Railways due to their door-to-door strategy which was mentioned earlier. Other actors however are still very much thinking about a certain mode of transport. This is not a surprise because mostly this is their only responsibility and they simply do not have the resources or authority to do it differently. Movia's only responsibility for instance is to do the planning for the busses. And the Stadsregio Amsterdam is only giving out concession for bus transport and the trams and metro trains in the City of Amsterdam. They are not responsible for any train, any shared bike or shared car. At the NS this is different since they have a coherent strategy. They look how they can connect their main product, which is the train, with their other products so that more people will use it (117, 2014). However, it has to be considered that the NS plans the door-to-door strategy only with modes that belong to the NS. Apparently also the DSB has the same target but they simply do not cover the entire range of transport products as the NS does (I01, 2014). Therefore they are dependent on other actors to fulfil this goal. And if other actors do not have the same target this becomes rather difficult.

The penalty and bonus policies facilitate the trend to act in a narrow minded way. The operators will try to get more passengers to get the bonus (CRC) or more direct income (CRA). Yet, it is not the case that they have the mind-set to promote also the other available forms of transport although more people in one link of the transport chain means also more people in the other links (I09, 2014). Additionally "[...] everybody is only playing from their own interest and they do not see the bigger picture" (I21, 2014). On the other hand the operators will get penalties if they have for instance delays. Due to this policy the operators are not open to share the infrastructure which is only meant to be used by them (for instance bus lanes or tram tracks) with other modes of transport beside the private car since it might causes delays (I15, 2014). Considering the GOGO project in Amsterdam Nieuw West, there was not even the thought about integrating the new system into the existing public transport system (payment and booking). The GVB was asked to cooperate but "they were not really ready and not yet very interested. They think it is new, it is innovative and their business is not equipped for those kinds of experiments" (I13, 2014).

Another very important aspect is that forms of transport which became part of the transport landscape rather recently are not yet considered as part of the transport chain like car sharing, bike sharing and other new trends of collaborative mobility. "Two actors that haven't been that present yet is the car-sharing and the bike-sharing" (I04, 2014). Only a few interviewees mentioned the importance of the new forms: "Sharing is getting more important than owning something. [...] This means that we have to deal in another way with all kinds of private parties. And well we have to learn this. It is a learning process" (I12, 2014). Furthermore, "they [car-sharing and bike-sharing] have big potential but they need to be combined with everything else. I think it is quite interesting how that could change things in the future" (I04, 2014).

One aspect which hinders the integration of new transport forms into the existing system is that the challenges institutional actors are facing are different. In the more rural areas around the densely populated areas car ownership is not as much considered as a problem as in the city centers. In the rural areas the air quality is better and there is much more space available, also for the car. Therefore they do not share the same goal of decreasing individual motorized traffic which is explicitly set by the Municipality of Copenhagen and the Stadsregio Amsterdam; although it is the cars from the rural areas causing the problems in the city-centers and not the cars from the people living in the city centers (I02, 2014; I10, 2014). In both cities, Amsterdam and Copenhagen, car ownership is at a relatively low rate. Institutions from more rural areas rather face economic problems meaning that they have less money available to spend for public transport (I09, 2014; I02, 2014; I16, 2014). They do not consider yet that one shared car replaces nice private cars.

Although most actors do not have a mind-set yet which is focused on intermodality, the professionals who were interviewed agree that cooperation is crucial in order to make the travel by public transport more attractive, since "you have to cooperate in order to make the travel from A to B easy" (I01, 2014). Many highlighted the importance of cooperation (I01, 2014; I02, 2014; I09, 2014; I11, 2014; I12, 2014; I18, 2014; I21, 2014). Especially in regards to the development of mobility stations it is important to work together since "that is where the interchange between modes is" (I20, 2014). In the same line, (administrative) borders do not exist in regards to transportation. Thus, the actors from different (administrative) regions and governance layers have to work together (I12, 2014).

Sub-category	Findings
External Competition	- Operators see other operators as competitors;
	<ul> <li>This is supported by the economic focus of</li> </ul>
	the companies and the bonus/penalty
	system of the transport authorities
	<ul> <li>Competition over financial resources (accounts</li> </ul>
	especially for the transport policy actors)
	<ul> <li>No competition between operators if they belong</li> </ul>
	to the same company
	- The competitive mind-set is a barrier to a door-to-
	focus which has to include all actors
Internal Competition	<ul> <li>Complex structure within the institutions</li> </ul>
	- Lack of cooperation between the different
	departments (e.g. between planning and financial
	department)
	- Different interests within in one
	company/institution (e.g. NS-Reizigers and NS-
	Stations)
Market	- Positive attitude towards the current organization
	of the system based on market principles
	<ul> <li>Market based system stimulates innovation</li> </ul>
	- The current market is not organized in a fair way
	since several concessions are not part of a
	tendering process
Fear	- If a structural change is necessary in order to
	enhance the level of cooperation, fear about
	losing the job or power is a barrier
Intermodality	- Door-to-door strategy only followed within DSB
	and NS
	- Actors are focused on their core business and do
	not consider other actors in their decisions
	- No common goal in the public transportation
	sectors
	- Public transport is mainly considered in the
	traditional way (train, bus, tram, metro) – forms
	of collaborative mobility or alternative forms of
	transport are not considered as public transport

Table 7: Main Findings Concept Mind-set

#### 7.2 Power



#### Figure 12: Coding Structure Concept Power

The second main concept which was derived from the interviews it the concept of *power*. Here, all statements are collected which were in some kind related to hierarchies and decision-making. These statements are particularly interesting in regard to this research project since they can give indications which actors could be facilitators of a transition to an intermodal system based on customer focus and not only on economic focus. The information of the interviews supplements in this way the findings of the network analysis (*Chapter 6*). The concept of power has been divided into the categories of data, decisive (-power), initial (-power) and financial (-power).

The first category refers to the fact, that it was frequently mentioned that the ones who own the data about passenger numbers, flows and satisfaction hold a certain degree of power since they have an information advantage compared to other actors. Secondly there is the category of decisive power. This category is sometimes overlapping with financial power, since oftentimes the ones who pay can also decide for which purpose this money should be used for. Still, they are separated because sometimes actors can have decisive power without having financial power. Finally there is the concept of initial power. Here, statements are gathered concerning the ability of an actor to initiate new ways of operation and to bring new ideas into practice.

#### 7.2.1 Data

It is crucial for a customer focused system that transport institutions and operators share information. The most obvious example for that is that the actors inform another actor about a delay or a restricted availability. In the CRC this should be already the case since "every operator has the duty to put it [the information] into the system (I01, 2014). The system where the operators have to put in their information is called Rejseplanen. This is similar to the Dutch 9292 system. However it is not possible yet to get real time information through this system. This is due to the fact that legislation prohibits that Banendenmark shares information with the DSB and with Rejseplanen as well. The traveller might be informed about a delay of a train but it is also important that the traveller gets a prediction of the time it needs to fix the interruption (I20, 2014). If there is a breakdown in the train system the customer will not see it when asking Rejseplanen for a connection. Furthermore there is no system to provide the passengers with real time information in the busses in Copenhagen and neither in Amsterdam. An interesting point is that in the Netherlands, the passenger can inform him-/herself about delays and interruptions on the website of the NS but not via the website of 9292ov. In general, operators are not willing to share information due to

future tendering processes, where access to data can be seen as a competitive advantage (W2, 2014).

A good example which shows that this information exchange can work is the new bike-sharing system GoBike in Copenhagen. It is fully integrated into the information system of Rejseplanen and the trains. Therefore the traveler can get real time information about the amount of bikes available at a certain station. It is important to mention at this point again that GoBike has a contract with the DSB since it is observable that data exchange works better if the products belong to one company. In this situation the actor can see the immediate benefit namely more satisfied customers. Apparently companies do not see this immediate benefit when sharing information with other companies.

In regard to the data the institution behind the ticketing system is very important. Since in both countries there is a nationwide contactless ticketing system, the institution which manages this system gets all the data about passenger numbers and –flows. In the Netherlands this is the institution called TransLinkSystems. Some actors are not very pleased with the fact that TransLink can see which lines are very profitable and which ones are rather not profitable (I18, 2014).

Lastly, it would be ideal if the customer satisfaction surveys and their results would be collected by a third, independent part. This could be for instance the consumer association. It is already common practice in England where Passenger Focus (comparable to the Dutch Rover) conducts the national railway survey. In this way the information is handled in a transparent way and operators/institutions are forced to work on improvements. It is however not the case in the Netherlands and not in Denmark either. The Danish Consumer Council tried to establish a national survey but it was not successful in implementing this plan (I06, 2014).

#### 7.2.2 Decisive

Building up on the data exchange problem it is important to know which actor would have the decisive power to change that situation in order to reduce the uncertainty and increase the service quality for the travelers. Those two factors would increase the attractiveness of the public transport system which might lead to an increase in passenger numbers. However, some actors have more decisive power than others and can therefore also inhibit improvements for the travelers. Apparently the Danish Consumer Council did not have enough power to establish a national passenger survey. The Ministry of Transportation however could force all transport companies to make their passenger satisfaction data transparent or to collect them centrally. The Ministry of Transportation could also force the operators to exchange information about connections and travel time in a way that real time information is possible. This also accounts for the ticketing. If it is about checking in once and checking out once (*single check in/check out*), instead of checking in and out in every mode of transport, TransLinkSystems could implement this very quickly for the Netherlands. And it would make exchanges easier. But it is politically not demanded (I14, 2014).

It was however politically demanded that Rover is asked for their opinion if there are changes in public transportation done by the parliament. The national government decided to make it obligatory to ask Rover before a decision is done and now it is common practice (I11, 2014). Therefore Rover has a certain degree of decisive power although it does not have financial power (I11, 2014; I18, 2014). It is obvious that the high level politics possess a high degree of decisive power

which they could use to increase the attractiveness of public transport (103, 2014; 105, 2014; 109, 2014).

Another level with high decisive power is the level of the transport authorities. They can induce change by putting certain demands into their concessions (I03, 2014; I09, 2014; I11, 2014; I18, 2014; I20, 2014). However, putting more demands into the concession sometimes oftentimes goes along with higher costs for the operators (I20, 2014). Therefore the authorities are again dependent either on the Ministry of Transport (CRA) or the municipalities (CRC). Here, the close interdependence between decisive and financial power becomes obvious.

The last thing which is important to mention in regards to decisive power is ownership. The actor who owns a certain ground, building or vehicle can decide what will be done with it. This is especially interesting if it comes to the change or development of mobility stations. Here, the parts within the station and the parts around it usually belong to a variety of actors (I01, 2014; I21, 2014; I22, 2014). This makes it difficult to follow a certain target because also in this case the different actors will follow their own interest and usually not consider the bigger picture (I21, 2014). When it comes to car- or bike-sharing the municipalities have a large influence through their parking policies. In Amsterdam for instance, the municipality created a ticket for Car2Go so that the cars can be parked on every public parking spot (I15, 2014; I12, 2014). This was not possible before and still is not in Copenhagen.

#### 7.2.3 Financial

As already mentioned, decisive power and financial power are very much related. The financial aspect is omnipresent in the discussion about public transport. And due to the market based system also the companies focus strongly on their income. Money gives a high degree of power and by putting it in the right channels improvements can be made possible for the traveler. There is only one example of cooperation between a car-sharing company and a bus line and this was only possible because there was funding coming from the Danish Ministry of Transport. It is the project on the line 350S which is a long distance bus line crossing Copenhagen. Here, the Ministry financed the setting up of around 15 cars along the bus line and the marketing of the project. In this way travelers using the bus line can get discounts on the car sharing cars of LetsGo (I07, 2014).

Another example - although one which is not really beneficial for the travelers - is that some bus lines are only running within the borders of the City of Frederiksberg. Worth mentioning is in this regard that the City of Frederiksberg is a curiosum: It is completely surrounded by the City of Copenhagen. It is not very plausible that some bus lines are only operated within its municipal borders since the traveler does not consider such borders (I09, 2014). However, Frederiksberg insisted on having these bus-lines and Movia had to plan them because Frederiksberg pays Movia for that (I09, 2014; I01, 2014; I02, 2014).

In addition to that, it becomes obvious in this category what was mentioned before: The NS and the DSB act as private companies but in fact the governments have a significant influence on their operation due to the fact that they own all the stakes and provide the companies with subsidies. If these operators have plans which have large scale implications, the government has to agree. Therefore, the Ministry of Transport can be seen as the actor with the most decisive and financial power within the public transport realm. Nevertheless, through the decentralization process which

took place in both regions in the last decades, some financial power was given to the lower, regional levels. Nevertheless, the regional levels are very much dependent on the money they get from the state. The municipalities are independent from the state to a certain degree because of their own tax collection. Therefore they can be seen as the second important actor in the transport sector.

Also the operators which are subsidiaries of other large national state owned companies like Arriva or Keolis can act differently on the market as smaller private companies or cooperatives. Arriva has the financial resources to set up a new car-sharing scheme in Copenhagen with 400 electric cars (107, 2014.) The more established cooperative LetsGo is even after years of operation far away from this amount of cars. This accounts as well for private companies like Daimler or BMW. They can operate the largest car-sharing schemes in the world although they are making losses with it since they established the schemes – simply because they are big enough and have the financial resources. In the end the transport sector is dominated by large institutional actors as well as large private companies in regards to decisive and financial power.

#### 7.2.4 Initiative

Initiative power is a category which again seems very similar to decisive and financial power. And it is also true, as it was just mentioned, that an actor with a large budget can implement new ideas more easily than actors with a smaller budget. Initiative power is however more about the actors who start initiatives for an improvement and which are innovative. This does not necessarily apply for large institutional actors. Here, actors like Mobycon or Copenhagenize Design Company can play a big role. They are consulting authorities and can induce change through new ideas (I18, 2014; I19, 2013). Also universities belong to this category since students and post graduate academics can start initiatives in cooperation with authorities and private parties to improve the customer experience (I02, 2014; I12, 2014; I01, 2014; I09, 2014; I11, 2014).

However, in general it is mostly the regional and municipal authorities coming up with certain projects in order to enhance the public transport system (I01, 2014; I02, 2014; I09, 2014; I16, 2014). The Stadsregio Amsterdam for instance has started the project Knoopuntmanagement *(Node-Management)* in order to improve the existing station infrastructure so that the stay becomes more pleasant and the way-finding easier. Here, all the actors of the Stadsregio work together on solutions. The operators themselves do not have much initiative power since they are bounded by their contracts. Furthermore, they do not have an incentive to do more than demanded by the contract (I11, 2014; I20, 2014). Lastly it is Rover initiating many projects on improvements in the Netherlands (I11, 2014; I16, 2014; I18, 2014).

Sub-category	Findings
Data	<ul> <li>Access to data can be considered as power</li> <li>Due to lack of data exchange real time information is not possible</li> <li>In some cases legislation prohibits the exchange of information</li> <li>Data (about passenger satisfaction and numbers) is handled secretly due to future tendering processes</li> <li>The transport authorities and consumer councils want to make data available for the public</li> <li>Data exchange works if the companies have the same owner</li> </ul>
Decisive	<ul> <li>National state has a high degree of decisive power</li> <li>Public Transportation is highly politically influenced</li> <li>Also transport authorities and municipalities decisive power</li> <li>If it comes to a mobility station, ownership means power over decisions</li> <li>Consumer councils like Rover have decisive power, but only if it is politically demanded</li> </ul>
Financial	<ul> <li>National state has the most financial power, after that the municipalities since they have their own tax collection</li> <li>In general, larger operators have more power and can start large scale projects due to their financial resources (Car2Go, Arriva)</li> </ul>
Initiative	<ul> <li>High level politics has the power to start initiatives</li> <li>Also consultancies, universities and consumer councils have a considerable degree of initiative power</li> <li>Operators only have initiative power if they have a monetary incentive</li> </ul>

Table 8: Main Findings Concept Power

## 7.3 Structure



Figure 13: Coding Structure Concept Structure

The last concept which came out of the coding process is the concept of structure. In many ways this issue was addressed by the interviewees. It is about the way public transportation is organized. It is a very controversial topic however there are some trends which are homogeneous. The first category under this concept is centralization. Consequently the second category is decentralization since those are the two ways a transport system can be organized.

#### 7.3.1 Centralization

In several interviews the professionals explicitly stated that the transport system should be organized in a more centralized way (I01, 2014; I02, 2014; I03, 2014; I04, 2014; I05, 2014; I14, 2014; I18, 2014; I21, 2014). No one said that the state should buy everything back, but obviously the benefits the customer would have in a centralized system are well known. As mentioned earlier, the benefits of a centralized system can be seen when looking at the NS. The information exchange and the integration of different transport options work very well for the customers. They offer the only Taxis, shared-cars and shared-bikes that can be paid with the OV-Chipkaart (I19, 2013). No other private actor is included in this system.

The fact that the system is in both, the CRC and the CRA, already very decentralized brings some disadvantages which are already recognized by the institutions. In the CRC for instance, a new institution will be formed which should act as a common interface for all transport operators. The benefit of this central actor is obvious: If a traveler forgets something in a bus or a train in the current configuration, the traveler has to know where he/she forgot the item in order to call the right operator. In the future there will be one actor which can be called and can deal with this situation (I02, 2014; I03, 2014; I04, 2014).

Also some interviewees call for an extension of the transport authorities' power. They promote an extension of the Stadsregio Amsterdam and Movia. In this way there would be one organization buying all transport including trains, metro, trams, busses and even shared cars and bikes (I03, 2014; I13, 2014; I09, 2014). In this way the operation could be simplified and better coordinated. Furthermore this institution could force all actors to work together in a better way (I03, 2014).

Another aspect which was mentioned in both regions is that the separation between the rail infrastructure and the rail operation should be reversed since it causes a high degree of inefficiency (I01, 2014; I03, 2014; I21, 2014).

#### 7.3.2 Decentralization

As many respondents mentioning that it would be better to centralize some parts of the transport system also asked for decentralization (I01, 2014; I02, 2014; I03, 2014; I04, 2014; I06, 2014; I09, 2014; I16, 2014; I20, 2014). Many times it was even the same respondents asking a more decentralized system and at the same time for a more centralized system. This is because both ways have their particular advantages. The fact that the state gave more responsibilities to the provinces and municipalities done on lower levels the institutions know better what their citizens demand (I18, 2014). The fact that some duties were given to private operators was supposed to make the whole operation and management of public transport more efficient and less costly (see chapter Market). The situation now is that a very complex structure evolved due to the decentralization process were power is spread over several actors. A disadvantage of this process, which was mentioned several times, is that negotiation processes are now very time consuming and inefficient since every party wants to see its interests represented in the decision making process (I01, 2014; I02, 2014; I09, 2014; I11, 2014; I18, 2014; I05, 2014). "[...] there is a lot of energy lost in this process" (I05, 2014).

Naturally the question comes up which system is the better system in order to have a passenger focus bus on the other hand low costs. The interviewees had a quite similar answer to this question: It should be something in the middle with the benefits of both systems (I03, 2014; I20, 2014). In addition to that, many were of the opinion that always when there is a trend to decentralization there will be after some years the trend to centralization again (I01, 2014; I09, 2014; I18, 2014; I19, 2013; I20, 2014) since "[...] it just goes around in circles" (I01, 2014) and "fundamentally it is just a game" (I03, 2014).

Sub-category	Findings
Centralization	<ul> <li>Many actors called for a more centrally organized</li> </ul>
	system
	<ul> <li>Several times the concept of one transport</li> </ul>
	authority buying all transport was mentioned
Decentralization	- Also many actors called for more decentralization
	since lower levels of institutions know better
	what their citizens demand
	- One disadvantage in a decentralized system is the
	energy being lost in long negotiation processes
	- Both approaches have their particular
	advantages, therefore most actors opted for a
	system which combines the advantages of both
	approaches

 Table 9: Main Findings Concept Structure

## 8 Workshops

The workshops which were organized during this research project tie up exactly at the point where the last chapter ended. They took place at the end of each research period: The workshop in Copenhagen on the 29.04.2014 and the workshop in Amsterdam on the 24.06.2014. Following this strategy had several benefits for this research project.

## 8.1 Organization

The organization of the workshops was highly time-consuming and accompanied by uncertainty. The main problem in this regard is that a research project conducted by a student is not taken very serious by the professionals in the field. Thus, already from the beginning of the data-collection, it has been tried to find partners within the companies/institutions who were willing to cooperate by organizing the workshops. In the end of every interview it was asked if the interviewee would be interested in participating. In Amsterdam the professionals were generally very open to that, in Copenhagen it was rather disinterest observable. Nevertheless, the City of Copenhagen was very cooperative and offered help in organizing the first workshop. They offered a room in the city hall and also catering. Furthermore, and that can be seen as a crucial success-factor, they sent the invitation to the other stakeholders. The invitation came from a student.

The workshop in Amsterdam was organized in a similar manner. Here, it was possible to acquire the Stadsregio Amsterdam as a partner. The same as in Copenhagen, they offered a room and catering. Furthermore they were very helpful in getting the contacts to potential participants since not all the professionals who were interviewed before were able to participate. In this way, both workshops took place and considering the feedback from the participants they can be counted as a success. In both cities, Copenhagen and Amsterdam, the group of participants consisted of a variety of persons with different backgrounds. The transport policy actors, the public operators and the public/private operators were represented. Nobody could be found to represent the private operators. They did not respond to the invitation. The number of participants was eleven in Copenhagen and 8 in Amsterdam. The focus was narrowed down to actors from the capital cities itself, excluding actors from the other municipalities forming the administrative region. By inviting the surrounding municipalities, the amount of people would have most likely been too high for the setting.

The program which was prepared for each of the three-hour lasting workshops was very similar, but adapted to the respective situation. Two short video clips were created and shown in the beginning in order to raise the attention of the participants and to establish a creative and positive atmosphere. Here, the insights on positive communication gained during the internship at Copenhagenize Design Company were of great help. The video clips can be found in *Annex 4*. In the videos, a positive atmosphere is created by showing harmonious scenes from the cities. Furthermore scenes showing different transport modes illustrate that there is already a mix of transport modes existent within the cities. In a next scene, a short trip done with a car is demonstrated in order to show how simple it is

<sup>&</sup>lt;sup>7</sup> Annex 4 contains everything which is related to the workshops: The invitation, the follow-up, the videos and a selection of photos

to move with a car and the system build around to support the use of cars. In the last scenes new forms of mobility are shown which are not yet integrated into the system and/or new collaborations which can be seen as good examples for cooperation.

After the clip a Prezi-presentation followed in order to introduce the research project to the participants who were not yet familiar with it and to show the current research results. Building on those research results, statements taken from the interviews were shown anonymously in order to confront the participants with the problems which were mentioned in the statements. The statements were chosen in order to address the concepts which were derived from the interviews.

#### The statement

# "There is a great incentive for the DSB to steal the customers from the busses because if they use a [shared] bike instead of the bus they double their income." (105, 2014)

points for instance at the competitive atmosphere within the public transport sectors. The participants were then asked how they see the problem and which solutions they would propose. Other statements were pointing at the lack of inclusion in regards to new- and alternative forms of transport into the existing public transport system.

After two sessions of discussion the participants were asked to draw their ideas of an ideal mobility station on a piece of paper. In Copenhagen the group was divided into two smaller groups drawing two drafts whereas in Amsterdam one group came up with one draft. This exercise was done in order to see which mind-set is present in the ideas of the professionals. From the results it can be derived if they attach importance to new forms of mobility. Lastly, a follow-up summary was sent to all participants sometime after the workshop took place.

### 8.2 Results of the Workshops

It cannot be said that the workshops helped to find solutions to the problems which were addressed. However they can be seen as a means to verify the research results and to shed more light on the sources of the barriers to a better cooperation between the actors. Also, the workshops can be seen as a learning experience for both, the participants and the researcher. By discussing the research results together with other professionals, these events might help to raise awareness on problems which are not addressed by the daily work.

All actors were of the opinion that the cooperation is not sufficient and that something has to be done to change this situation in order to make public transport more attractive. It was very useful to have a representative of the consumer council at both workshops since these actors have the knowledge and the ability to challenge the opinions of operators and institutions. Something that unifies all actors was the fact that the majority of problems cannot be solved on the levels they are working in; they can only be solved by decision makers of higher administrative levels. This shows that it is important to present the results of this research project to higher administrative levels. In both workshops the participants mentioned the fact that the contactless ticketing systems (OV-Chipkaart and Rejsekort) were not made to please the customer but to please the operators since they make it possible to divide the money for a ride precisely.

Besides the fact that there is a lack of cooperation the actors agreed also on the point that new forms of mobility are not sufficiently incorporated into the existing public transport system. In this regard it was observable that the professionals do not have the mind-set of mobility yet instead of thinking mainly about a single mode of transport. New forms from the collaborative mobility realm (peer-to-peer sharing, applications for smartphones in any sense) were not mentioned at all; they were also not included in the drawings of the mobility stations. Furthermore, there is apparently a mismatch between the economically sustainable operation of public transport and the focus on the customers' needs as already mentioned in <u>Chapter 4</u>. Many times the participants mentioned that they do not have enough (monetary) resources to make public transport more attractive.

Another important outcome of the workshops is that for many professionals it is either not clear who should take responsibility to integrate the modes of transport in a better way or they do not want to take this responsibility. Sometimes they would like to do it, but they do not have the resources to do so or not the mandate to do so. Therefore, the roles of actors are not clearly distributed. Generally, there is no common goal or vision to be followed, neither in the CRC nor in the CRA.

## 9 Synthesis

The main motivation behind this research was to contribute to the establishment of a sustainable transport system based on the principle of intermodality instead of individual car ownership. As a starting point it has been assumed that it is more complicated to cover a distance in the current transport system using several modes of transport instead of the individual car. This is due to a lack of cooperation between the institutions/operators behind the various transport modes. In this chapter the results of this research will be presented according to the sub questions which have been developed in order to answer the main research question.

#### 9.1 Sub-questions 1 and 2

# What are the relevant stakeholders in the Stadsregio Amsterdam and the Hovedstaden Region who plan, design or making use of mobility stations? *and* How are those actors related and in what ways do they cooperate?

An extensive description of the actor constellation within the CRC and the CRA has been provided in <u>*Chapter 5*</u>. Figure 2 and Figure 5 provide an overview of the complex structure which is prevailing in both sectors. Apparently, the situation in both regions is quite similar. There are transport policy actors and three different kinds of operators (public, public/private and private) involved in the provision of public transport. All operators are organized as private businesses. In this way, the sector is supposed to function based on market principles. This means that the operators of public transport services go into a competition with other operators in order to get the contract to run certain bus or train lines. However, there is not one central authority responsible for the tendering of the transport services within the regions under study; there are several authorities responsible for different modes of transport. In the CRC there is the Danish State responsible for all train services, the Metro for the metro services and Movia for bus services. In the CRA it is a very similar situation. The Dutch state is responsible for train services and the Stadsregio Amsterdam is responsible for bus, tram and metro services. In this way, two or even three groups of public transportation exist next to each other with a poor level of integration.

The one group of public transport consists of the train operators and the national state (see *Figure 9* and *Figure 10*). Within their companies the DSB and the NS offer a variety of products. In the Netherlands this is trains, bike sharing and taxi services. The NS allows also one car sharing operator (GreenWheels) to use its logo. In Denmark, the DSB offers train and commuter train services as well as bike sharing. All transport modes are well integrated into the portfolio of the respective train company (real time information on availability of shared bikes in DSB trains, business subscriptions for the train companies including the use of shared bikes (DSB and NS) and benefits on car sharing (NS), information exchange in the case of a delay).

The second group of public transport consists of all the transport modes which are managed by the transport authorities Movia and the Stadsregio Amsterdam. Here, the situation between the CRC and the CRA is different. The Stadsregio Amsterdam is doing tendering processes on areas whereas

Movia is doing tendering processes for each bus line. These bus services (in Amsterdam also metro and tram services) exist next to the services which are offered by the train operators. The two fields are poorly coordinated. Two examples from the CRA underline this research result: Firstly, an NS discount card is valid for NS services but not for transport services offered by other operators within the CRA. Secondly, the Stadsregio Amsterdam initiated a day ticket which is valid in all transport modes in the CRA but it cannot be used in NS trains. In Copenhagen it was explicitly said, that the DSB is even competing with those bus services.

The actors which are offering their services in the above mentioned fields are all considered as public transport operators since they get their mandate from public authorities. There is however a group of private operators which are offering their services without being "asked" for it. The services those actors offer are not considered as public transportation and are therefore not incorporated into the system in any way. By legislation is not possible for them to be integrated into the payment system of the respective region. Furthermore there is no information exchange for instance on availability or delays of other transport modes. Also new forms coming from the field of collaborative mobility (peer-to-peer car-sharing, private taxi services, etc.) are not incorporated into the existing public transport system.

Apparently, the different actors within the transportation sectors of the CRC and the CRA do *not* cooperate sufficiently. Therefore, it has been investigated which actors are central to the network in order to see who is able to enforce cooperation. It has been calculated how each actors scores in terms of betweenness centrality. *Figure 7* and *Figure 8* illustrate the results of this calculation. In addition to that, the role of each actor has been determined based on the calculations. According to this methodology, the two capital municipalities (Amsterdam and Copenhagen) are highly central to the network. They have the ability to link all three groups of actors because of three reasons. Firstly, they have connections to most actors in the network. Secondly, they are linked to all other central actors in the network. Finally, they have decisional and financial power. These cities have an exceptional position since they can be considered as the most important cities in terms of size, cultural life and financial power in their respective country. If they are able to bring the actors together in order to integrate their operation it might have positive spillover effects upon smaller municipalities.

Additionally, there are other actors which are highly central to the network and at the same time powerful. These are for instance the transport authorities (Movia and the Stadsregio Amsterdam). They can force bus operators to better integrate their activities with other operators by including this aspect into the concessions. However, this would increase the costs for the operators. Therefore, the transport authorities need a larger financial budget if they should take the lead. Here, the municipalities (Denmark) or the state (The Netherlands) have to take action.

Finally, it is important to mention the role of the travelers' councils. They can act as a watchdog organization and – if politically supported – can force the operators and authorities to establish a passenger focus within the sector.
### 9.2 Sub-question 3

# What are the reasons for the existence of the institutional and physical barriers travelers making use of public transportation modes face at mobility stations?

The last section pointed out which actors exist in the public transport sectors of the CRA and the CRC, how they are related and who is central to the network. It has been stated, that the actors do not integrate their activities sufficiently. This is however a prerequisite in order to make the use of public transportation more attractive. Especially in regards to trip chaining, which was mentioned in <u>Chapter 4</u> as a main barrier (physical and institutional) to the use of public transport, it is important that the actors collaborate. The second part of this research project was about to find reasons for the fact that they do not act accordingly.

The interviews have been analyzed by using methods derived from the grounded theory literature. Through a coding process, three main concepts have been detected which can be seen as fields which have to be addressed in order to enhance the cooperation within the public transport sectors. These concepts are *mind-set, power and structure*. In the following part it will be outlined, how these concepts affect the barriers that travelers facing in public transport (based on <u>Chapter 7</u>). In this chapter the sub-question 3 will be answered by connecting the results of the qualitative analysis with the variables which have been defined in <u>Table 2</u> in <u>Chapter 4</u>.

### 9.2.1 Reliability

Exchanges can only be comfortable and fast if the connecting mode is on time. In an intermodal transport system however the probability is relatively high that one mode within the transport chain is delayed. In this case it is important to decrease the level of uncertainty for the traveller by providing information and alternatives. In case of a breakdown in the train network for instance, the customer should be informed about all alternatives in order to still get to the destination on time. In an ideal case this should happen without extra costs for the traveller.

This situation is not imaginable in the current transportation system of the CRC and the CRA respectively. In the case for a missed connection, the traveller will be just told to wait for the next connection. There are several reasons for this. Firstly, there is the economic focus the actors have since the privatization process was induced several years ago. From an operator's perspective, there is one important thing that has changed due to the privatization. Let us assume that there is a fictive train operator. In the past, it did not matter for that company if a traveller chose another mode of transport instead of the train; the company got the subsidies anyway. Now however it would be a problem since every passenger in another mode would mean less money to the fictive company. Therefore, a competitive *mind-set* has taken over in both public transport sectors. This competitive climate is contra productive to the aim of more reliable public transportation.

In order to make public transportation more reliable and therefore more attractive the actors have to work together and help each other in the case of a delay or interruption. However, the operators simply cannot say that the customers should use another mode of transport in case of a delay since somebody has to pay for it. And if that is not the traveller, it must be the operator. This is however highly unrealistic since the operators are equipped with a certain budget and bound in their contracts. The do not have the freedom nor the incentive to help another actor and therefore the customer.

#### 9.2.2 Accessibility

In order to tackle the biggest advantage of a private car, namely that it is usually available in front of the house, the accessibility to public transportation has to be enhanced. In this regard, the traditional and expensive way is to enlarge networks and to increase frequency of services. There is however a more cost efficient way, which is again related to cooperation between actors. In this regard it is useful to take again the example of the day ticket mentioned in the previous chapter (*Chapter 9.1*). Due to the fact that the day ticket is only valid for bus, tram and metro services within the Stadsregio Amsterdam and not for train services, the accessibility is lower. The problem behind this is that the different groups of actors which have been identified in *Chapter 6.3* are not working together sufficiently. In this case it is the NS and the bus operators authorized by the Stadsregio Amsterdam. Here, Copenhagen is ahead since day tickets or tickets for special events are always valid for all modes.

Also in regards to the accessibility of car-sharing cars there is room for improvement. Since a registration is necessary for each operator, a customer has only access to the cars he/she is registered for. If one registration would be sufficient to have access to shared-cars of different operators, the accessibility would be enhanced. The examples show that also in regard to accessibility, a competitive mind-set is counterproductive.

Lastly, a decreasing factor for accessibility is the fact that new forms of mobility like car-sharing, bikesharing, bicycle rickshaws or peer-to-peer car-sharing are not considered as public transport by legislation. Due to this fact it is not possible to pay them with the electronic payment systems OV-Chipkaart or Rejsekort. The legislator, which is in this case the national state, has to intervene in this case in order to improve the accessibility to alternative transport modes.

#### 9.2.3 Central Coordination

As mentioned in the literature and in the interviews, the traveler wants all transport services centrally organized. Centrally organized means in this sense that there should be one interface to buy transportation services since the traveler does not want to pay several times and gather information from different sources. Furthermore, it is preferable to have a single check in/check out system in regards to the contactless payment system.

Again, there are several reasons mentioned in the interviews why this is not (yet) the case. At first, there is a high level of distrust observable among the actors in public transportation which is as well contra productive to the aim of better cooperation. Since nobody trusts each other especially when it comes to ticket revenue distribution, electronic chip-card systems have been established in both regions under study. According to the interviews and workshops, those systems have only been developed in order to facilitate the exact money distribution among the actors. Therefore, they are not developed in order to please the customer but to please the operators.

In addition to that it has been discovered that fear is a barrier to a structural change within the sectors. One option that was favoured in both regions is for instance to have one transport authority centrally coordinating the transport in order to force all operators to enhance cooperation. In this case some actors would lose a certain degree of power – a situation they are afraid of. Also, employees are afraid of losing their position in the case of a structural change. This mind-set can be seen as a barrier to more central coordination.

#### 9.2.4 Travel Time

The variable travel time is highly dependent on the accessibility of transport services, the reliability of connecting services and the good coordination of connections. These variables have been discussed in the previous abstracts. Therefore it can be said that the variables reliability, accessibility and central coordination are have a large influence on the total travel time. Furthermore, the frequency of connections plays a crucial part concerning travel time. The matter of frequency of connections, however, was not part of this research.

#### 9.2.5 Information

Another very important aspect for the customer is the right amount of information at the right time. The analysis uncovered two reasons which are responsible for the fact that the level of information is in both regions under study not yet sufficient. The first reason is related to other factors which were already mentioned. Due to a lack of trust, the actors are not willing to share information with others. Furthermore, since the new forms of mobility are not yet considered as part of the public transportation system, there is no intention to incorporate information about them into the existing system. It is for instance not the case, that a traveller using a train gets information about the availability of car-sharing cars or other new forms of transport in the traditional mode of transport (train, bus, metro, tram) or in a station. Secondly, in some cases legislation prohibits the exchange of information or the presentation of information.

#### 9.2.6 Costs

Although not directly discussed in this research, also the ticket prices are influenced by the level of cooperation between the actors. One example which can be mentioned here is a discount card. If this discount card is not valid for all modes of transport within a region, the total price for a journey gets more expensive. Also, certain transport modes are being advantaged if a discount is only available for certain modes, which is not in line with the concept of intermodality and easy access. The reasons for different discount cards lie again in the argumentation why accessibility and coordination are lacking (see *Chapter 9.2.2* and *Chapter 9.2.3*)

#### 9.3 Sub-questions 4 and 5

# What changes have to be made in the network structure in order to facilitate cooperation between actors? *and* Which measures have to be taken in order to remove the institutional and physical barriers for travelers at mobility stations?

One way of tackling the above mentioned problems changes can be done in the network structure. Since the customers want everything "out of one hand" it would be imaginable that there is one actor which operates all modes of transport. Then, this actor could take care that all modes are well coordinated. This scenario is at this moment highly unrealistic due to the reasons which were mentioned in the previous chapter, namely fear of structural change and distrust between actors. However, it would be a promising solution. One central authority might have the potential to bring the three groups of actors together. Also, it would be able to force them to cooperate in a better way by including this aspect in the contracts.

In this system there would be one central authority buying all the transport. In this way the authority could still bring all transport services into a tendering process which would be in line with the principles of the market. Since the examples of the national rail operators show that coordination and integration function better if the modes of transport are under control of one organization, it can be assumed that this would also count for a transport system with one central transport authority. This central authority would have to work in close cooperation with the municipalities which have the linkages to the operators of new and alternative forms of mobility. In order to include them, the national government would have to change legislation. Unfortunately, there is no information on the private actors' willingness to integrate since no interviews were conducted with them. It would be however desirable if they were willing to.

But also without a central authority, the cooperation could be enhanced. In this sense, the central actors, which are in both regions the national state, the railway operator and the transport authority have to start integrating the transport modes. As a bridge actor the respective capita municipality might initiate this process since it is the actor that it best connected in each of the networks. In addition to that the national governments might change the legislation in a way that it becomes easier for alternative forms of public transport to become incorporated into the existing public transportation system.

One very important factor which might alleviate the competitive atmosphere in the public transportation realm would be the determination of a common *goal* which all actors would have to follow. This goal could be for instance decreasing the individual motorized transport. In this way, the actors would have one goal to reach together which might help the enhancement of collaboration and enhance the level of trust. Also informal meetings organized for decision-makers of the most central institutions might contribute to that. In addition to that, one central goal could help to change the single transport mode mind-set into an intermodality mind-set. Lastly, the transportation authority could reimburse operators when they evidently lost travelers to another public transport mode.

### 9.4 Sub-question 6

#### How do ideal mobility stations look like from a planners and practitioners perspective?

The last research question will be answered by examining the results from the workshops. Here, the professionals were asked to draw an ideal mobility station. In the exercise it was set that there is a station with crossing of a metro and train line. Furthermore it was said, that there are no financial limitations in the planning of this station. No additional information was given to the practitioners so that were able to think without limitations. The results can be seen in *Figure 14 – 17*.



Figure 14: Ideal Mobility Station Workshop Amsterdam



Figure 15: Ideal Mobility Station Workshop Amsterdam (180° rotated)

By - bil By- cyhel Short distance Clear Information (Way fonding) Real fime information in - Motro HUB-map on your Phone Create a good Bus Bus Train

Figure 16: Ideal Mobility Station Workshop Copenhagen (Group 1)



Figure 17: Ideal Mobility Station Workshop Copenhagen (Group 2)

Considering the drawings, there is one thing which is very apparent. The practitioners in Amsterdam included by far more relevant aspects into their drawing compared to both groups of Copenhagen.<sup>8</sup> Therefore, the approach of the Amsterdam workshop is more holistic including also factors like a liveable surrounding of the station, parking facilities for cars and comfort features for the travellers. They also included a service point where all tickets can be purchased.

In general, all three drawings are focused on short distances between modes. This can be seen as the main aspect in the opinion of the professionals. One drawing also includes shared-cars and –bikes (*Figure 16*: By-bil and By-cykel). This drawing is also the only one that includes real-time information. Considering also the information from the interviews, the aspect of short distance between modes is very difficult to achieve. Firstly, because it needs mostly a costly infrastructure change at the station to bring the modes closer together (e.g. the new bus station at Amsterdam Centraal). Secondly, as mentioned several times, the actors do not cooperate with others, they rather follow their own interest. Therefore, everybody wants to have the best spot at a station. Everybody wants to be as close to the tracks as possible (I21, 2014; I22, 2014). Also, the ground around a station is usually owned by various actors; also these actors follow mainly their own interest. At a mobility station this problem is most obvious.

Maybe because of this circumstance, that the effects of interest conflicts are most obvious at physical barriers, the professionals did not consider the institutional barriers. A station might offer short distances between modes but this advantage vanishes if there are different tickets systems, policies and registration processes making exchanges time consuming and uncertain. It shows that this problem needs to get more attention from the supply side in public transportation. Especially in regard to station development, a common goal seems to be helpful.

<sup>&</sup>lt;sup>8</sup> Due to the higher amount of participants, the group in Copenhagen was divided into two smaller groups in order to draw the station.

# 10 Discussion

In the following chapter, the results of this research projects will be discussed by placing them into the scientific debate. By doing so, also the societal relevance of the results will be addressed. Furthermore, it will be reflected on the limitations of this research project and finally, recommendation for further research will be given.

## 10.1 Placing the Results into the Scientific Debate

In this research project, the public transport actors' network structure of the Capital Region of Copenhagen and Amsterdam, respectively, has been investigated. Both networks were affected by tremendous restructuring process during the 1990s. The core concept of this restructuring process, which can be named as privatization, is "that provision (decisions about what services to provide) can be separated from production (the details of how those services are produced)" (Hebdon, 1995, p. 316). In the case of public transportation, the transport policy actors are responsible for the provision of a transport service and public, private or public/private operators are responsible for the production (operation) of a transport service. The reasons for the privatization process were the concerns with non-market failure in government, namely "bureaucratic unresponsiveness to citizen need" as well as "sluggish and high-priced government monopoly production" (Ibid, 316). This is in line with the interviewees' responses and still corresponds with their opinion about governmental services in form of monopolies.

In order to tackle the problems which existed before the privatization, "quasi-markets" were established which is exactly the case in the CRA and the CRC (Ibid). These quasi markets are based on "franchising arrangements whereby a local government authorizes a private firm to manage and operate the city's public transit system" (Karlaftis & McCarthy, 1999, p. 27). The results of this research show that service provision based on contracts has led to individualistic and competitive behavior. Operators offering transport services are focusing mainly on their own business in order to maximize the profit and perceive other actors as competitors. Due to the goal to maximize profit "private managers have stronger incentives for cost efficiency" (Ibid, p. 27).

Still, this issue has to be further examined. Lozano (2008, p. 499) stresses that "individualistic and competitive behaviors have become characteristic of modern societies. Such behaviors have created imbalances and conflicts among individuals, groups and organizations, as well as among the Sustainability aspects, i.e. economic, environmental and social ones in the short-, long- and longer-term." In addition to that "one of the key elements in the transition towards more sustainable societies is collaboration" (Lozano, 2007, p. 370). Building on that, in the short term, operators might succeed in increasing their revenues by focusing mainly on their own businesses. But in the long term, they would achieve even greater benefits by collaborating with other actors. Here, a concrete example is used to illustrate this concept. The NS -might increase its revenues by establishing door-to-door solutions with its own products. In the long run, though, the NS would probably benefit even more by including the bus operators or other transport operators into their door-to-door solutions. This is due to the fact that by collaborating with other actors, more people could have easier access to public transportation which might lead to more travelers in the entire system. In this way, everybody would benefit.

Taking the above mentioned into consideration, a structure for the organization of public transport has to be found which supports the collaborative mind-set. In this research project, the wrong mindset was one of the core issues emerging from the coding process. This is another indication that the current structure of the system might be not the optimal one.

In the scientific discussion about privatization the effects on cooperation between actors are not considered. The vast amount of privatization literature deals primarily with the economic effects of the process. Here, the question is usually if a system where privatization took place scores better in terms of efficiency than the previous system. The articles are not only focused on the evaluation of public transport systems; the majority of articles deals with privatization in other sectors like electricity or water supply. Megginson and Netter (2001) for instance did a survey on ten empirical studies on privatization and came to the conclusion that privatization can be regarded as more efficient and more profitable "than otherwise-comparable state-owned firms" (Megginson & Netter, 2001, p. 380). In the same line, a study of Karlaftis and McCarthy (1999) shows that in the City of Indianapolis there was an annual 2,5% reduction in operating costs observable since privatizing the management of its public transportation system. It seems natural that most studies focus on the economic effects of privatization since they were mainly conducted by economists. From this perspective it seems that privatization is the right way to organize a public transportation system. It is also understandable that those studies do not evaluate the effects of privatization on the cooperation between actors since in many sectors this aspect is irrelevant for the customer and for the government as well. This can be better understood by thinking of electricity. The customer does not have to change the electricity provider several times in a day. Therefore it does not matter if the provider cooperates with other providers or not. The customer does not have to be afraid that he/she will have blackouts due to a lack of cooperation between electricity providers. Public transportation however relys on good cooperation between actors in order to be attractive. Bearing this in mind, "there is little empirical evidence on how privatization affects consumers" (Karlaftis & McCarthy, 1999, p. 381). Also the TOD research community is asked to dive into this issue due to the fact that accessibility does not only include a physical dimension but also an institutional.

The researchers however discovered also drawbacks of a system which functions with a quasi market. In this regard, it is a common problem to specify the contracts (Prager, 1994). This problem was also addressed by interviewees in this research project. Especially if it comes to the enforcement of better cooperation, the authorities struggle to find ways to address this problem. Another negative aspect in this regard is that monitoring costs may be as much as 20% of the total costs of contracting out (Pack, 1989). Considering this, the scientific community does not speak with one voice on which is the best way to organize public transport. In sum, several researchers have dealt with the cost efficiency of different structures in public service suply systems but it cannot be said that one form is evidently ideal. Vickers and Yarrow (1991, p. 130) conclude that "any form of ownership is inevitably imperfect. Market failures can lead to divergence between profit and welfare objectives in state-owned enterprises."

### 10.2 Contribution of this Research

This research has set the focus on cooperation between actors in the transportation sector – a field which has gained little attention by the scientific community yet. In a consequence little to nothing has been written about this issue. Bearing this in mind this research contributes in several ways to the scientific community but also to society. The first way it contributes is the provision of a detailed overview of the stakeholders in the public transportation sector in the CRC and the CRA. Furthermore it displays their power relations and how these actors are connected. In addition to that it shows which actors score high in terms of betweenness centrality. In this way it is known which actors have the ability to induce change in the sector. This change could address for instance the mind-set which is present among professionals and focused rather on competition than on cooperation. Therefore, this research can be seen as a first trend indicator for the two regions under study. However, since other public transportation systems in western societies are organized in a very similar way it can be assumed that the results of this research would have been similar in other regions. Also because many problems travelers face are similar in other countries.

By qualitatively analyzing the interviews several concrete issues which can be regarded as barriers to better cooperation have been extracted which can be directly addressed by decision makers. These issues are internal and external competition, the power relations which hinder smaller entities to integrate themselves into the system and the wrong institutional structure which supports the competitive mind-set. Furthermore, a set of actors was brought together in order to participate in workshops. In this way the research contributed actively to a better cooperation in the public transport sector. In Copenhagen it was explicitly mentioned that the group of participants in the workshop should meet again in the future.

### 10.3 Limitations of this Research

Although it was tried to set up a research design which allows drawing generalizable conclusions there are several aspects limiting the generalizability. One of those aspects is the variety of actors which have been interviewed. In the Stadsregio Amsterdam for instance, three actors of the NS were interviewed whereas no bus operator could be convinced to give an interview. In the case of the GVB for instance it has been tried to contact it directly, via the Stadsregio, the City of Amsterdam, Rover and via the NS. Still it was not possible to get an interview with this important actor which was addressed in every interview conducted in the CRA. Also in the CRC it was not possible to contact the bus operators. However, in both workshops there was at least one representative of an operator present. Also, it was not possible to get in contact with the small scale private operators such as Car2Go or Hertz Delebilen. It would have been positive for the generalizability of the results to have the private side better represented in the data collection.

Furthermore, the researcher had an influence on the way the networks are displayed and therefore on the results of the calculations on betweenness centrality. The justification for the connections which have been created between the actors can be found in *Annex 1*, but another researcher might have drawn different connections. The bus operators in the Capital Region of Copenhagen for instance were divided into Arriva, Citytrafik and other bus-operators. This is due to the size and financial power of Arriva and Citytrafik compared to the other operators. Those three actors could have also been considered as one actor and with the consequence of a different degree for betweenness centrality for all actors but especially for Movia. Nevertheless, the conclusions which are drawn from the network analysis would have been not significantly different – The transport authorities, the national rail operators, the capital cities and the consumer councils would have been still the most central actors.

## 10.4 Recommendations for Further Research

Already mentioned in the previous chapter, there is no research available on the effects of privatization processes on cooperation between actors. This issue is of great interest especially from a sustainability perspective. It is important to know which network structure is most cost efficient in the long term. Here all aspects have to be taken into consideration: Not only how cost efficient a system is in terms of operational costs, but also in terms of attractiveness for the customers. The more travelers take public transportation instead of their private car, the better it is for the environment and for the society, since it would be also financially more sustainable. In general, research is needed on the effects of collaboration. Fadeeva (2004, p. 165) for instance asks if "collaboration [is], indeed, the most effective form of reaching desired objectives?".

A concrete research project in this regard would be the evaluation of the pilot project between Movia and LetsGo car-sharing in Copenhagen. It has to be investigated if due to a cooperation between those two actors the users of the car-sharing system and the amount of bus users increased. It would be also interesting to know if some people even switched from using their private car to the use of public transportation because of this initiative.

Another field which is not yet discovered is the mindset of the small scale private operators like the Amsterdam rickshaws or even of larger schemes like Car2Go. Do they actually want to be part of the public transport system or do they rather want to focus on their own business would be a relevant question to be answered.

Very helpful would be also a comparison between the level of cooperation within a privatized system and a state owned system. It would be however difficult to find a suitable case for this research. In most western societies the transport systems are already organized like in the Netherlands or Denmark. In other societies, where the provision and operation of public transport is still the duty of the state, the work culture might be very different to the working culture in western societies. Thus, the different working culture would most likely also affect the willingness for cooperation.

Lastly, research is needed on how new mobility forms like GOGO Nieuw West or peer-to-peer carsharing could be incorporated into the existing public transport system. Furthermore it has to be investigated if these forms could increase accessibility and replace inefficient lines from the existing system. Pilot projects would in this case the right scale for evaluation.

It has to be mentioned that the performance of a transportation system affects every person every day. It is crucial for a society that researchers continue to focus on this field in the future. Especially in times where predictions for cheap energy are not very promising and many countries facing challenges due to demographic change, results on how to make alternatives to private car ownership more attractive will benefit everybody.

# **11** Conclusion

The introduction of this research project started with an experience of an elderly couple taking a train and considering to take the private car again for the next time since that would be easier. Therefore, the initial question was asked, why the of public transportation is so complicated. It has been assumed that this is due to a lack of cooperation between the actors in the public transportation sector. Thus, this research project was conducted in order to investigate the reasons behind poor cooperation and to come up with recommendations on how to improve the cooperation. Consequently, the following research question was set up:

"How can the cooperation between actors in the public transportation sector in the Capital Region of Amsterdam and the Capital Region of Copenhagen be enhanced in order to clear institutional and physical barriers that travelers using public transportation modes face especially at mobility stations?"

In order to answer this question a grounded theory approach in combination with social network analysis was applied. 22 Interviews were conducted with stakeholders from the Capital Regions of Amsterdam and Copenhagen, respectively. The interviews were coded by making use of methods derived from grounded theory in order to gain relevant information about the stakeholders and their relations. With this information the degree- and betweenness centrality of each actor was calculated in order to see which actors are central to the network and can play a leading role in cooperation.

The results of this analysis are that in both regions, the national state, the national railway operator, the regional transport authority and the respective capital municipality (Amsterdam and Copenhagen) are the most central actors in the networks. The cooperation between these four institutions is however not sufficient. Each of the actors has its mandate that is to be followed. As a result, there are three groups of transport modes which are poorly coordinated: All modes which are run by the national railway operator, the bus services and finally all other forms of alternative transport (private car-sharing operators, taxis, bicycle rickshaws, etc.).

Furthermore, the interviews were qualitatively analyzed in order to find reasons for the lack of cooperation. Here, the concepts of mind-set, structure and power have been identified. In this regard it can be said that the current structure of the public transportation sector based on a quasi-market is supporting a competitive mind-set between the actors. As a result, operators are rather focusing on their own business in order to maximize their profit than cooperation with other actors. Due to this competitive mind-set the integration of transport modes is lacking with negative consequences on the accessibility to public transport, the reliability of connections and the total travel time of a trip.

In order to increase the validity of the research results and to stimulate better cooperation between the stakeholders in the sectors, two workshops were organized where the research results were discussed with a group of professionals from the two regions. Here it became obvious that the problems in cooperation between actors are complex and it is a difficult task to find concrete solutions to it. This research can be seen as a first insight to the challenges that have to be addressed in regards to cooperation in public transportation, but further research is needed in order to solve the problems that exist.

In the end one might ask which benefits this research has for the elderly couple. In this regard it can be said that it uncovered the effects that poor cooperation between actors in public transportation has on the travel experience of travelers. Due to an individualistic and competitive mind-set there is poor information exchange and assistance in the case of a delay and different tickets systems which make exchanges at mobility stations more complicated. Furthermore, the accessibility to alternatives to the individual car is limited due to different registration processes and legislation.

Bearing this in mind, the actors identified as central and powerful have to start working on a better integration of their operations. Measures have to be taken that the operators are not competing for the passengers anymore but to work in close cooperation with all other actors to increase the general number of travelers in the public transportation system. This can be seen as a common goal which has to be established. For their respective region, the City of Amsterdam and the City of Copenhagen should take a leading role in this regard.

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# 13 Annex

The Annexes can be found in a separated Dropbox folder. The link to this folder is <a href="https://www.dropbox.com/sh/hcms9genznccunm/AABDZ-rikxIEP7fwLoYUkmb2a">https://www.dropbox.com/sh/hcms9genznccunm/AABDZ-rikxIEP7fwLoYUkmb2a</a>