No Man is an Island

A Case Study of the Oresund Region from a Hub Perspective

Department of Management and Engineering, Business and Economics Program &
International Business and Economics Program, Spring Semester 2010
Acknowledgments

Working with this thesis has involved the exploration of a field of study that we initially had limited knowledge about, and even though it has sometimes seemed huge and very complex we have really valued this experience. Meeting a variety of different people within different fields, as well as getting to know a region, which we knew very little of beforehand, has been very rewarding.

During the process of writing this thesis, the authors have received support from several people who deserve acknowledgment. First we would like to thank our thesis advisor, Professor Fredrik Tell, for his invaluable input and support during the writing of this thesis. We would also like to extend our gratitude towards Saab Technologies and our supervisors Ebba Lindegren and Ulf Petersson. Without your collaboration, we would not have been able to reach this level of result. The feedback received from our seminar group has also been deeply appreciated.

Finally, credit is due to friends, family and Baljan, who have brought us through difficult times.
Abstract

Title: No Man is an Island: A Case Study of the Oresund Region from a Hub Perspective

Authors: Jana Brandon and Maria Lehtinen

Thesis advisor: Professor Fredrik Tell

Background: The world of today is immensely interconnected. Over the past decades, national economies have been de-bordered and the promoting of the flows of goods, people, capital and services across the borders is evident, as opposed to when flows only moved within national economies. Former vertical structures of old nations have been replaced by a horizontal flow structure in a complex and intertwined global economy. Attracting flows is essential for the growth and survival of cities. Hubs functions as important connection points for these flows and are therefore highly important.

Research procedure: The purpose of this thesis is to describe how city regions function from a hub perspective by mapping the most important hubs in the Oresund Region, and investigating the connectivity and collaboration between these hubs. This study has a qualitative and inductive approach with a case study design and the empirical findings is based on twelve interviews with representatives of different fields.

Results: The most important hubs were divided into three categories: transport, economic and infrastructure hubs, illustrated in the hub categorization model. The results indicate that there is a interconnectivity issue with interdependencies between the different hubs in the Oresund Region. This is illustrated through the hub relationship model. Collaboration seems to take place mostly within sectors and through the municipalities.

Keywords: collaboration, connectivity, dependency, flow, hub, infrastructure, network, system, Oresund Region, transport
# Table of contents

1. **Introduction** .................................................................................................................. 1
   1.1 Background .................................................................................................................. 1
   1.2 Problem discussion ..................................................................................................... 3
   1.3 Purpose of study ......................................................................................................... 4
   1.4 Research questions .................................................................................................... 4
   1.5 Delimitations ............................................................................................................. 4
   1.6 Chapter overview ...................................................................................................... 5

2. **Research procedure** ....................................................................................................... 6
   2.1 Introduction ................................................................................................................ 6
   2.2 Research approaches ............................................................................................... 6
      2.2.1 The systems approach ..................................................................................... 7
      2.2.2 The inductive approach ................................................................................. 7
      2.2.3 The qualitative approach ............................................................................. 8
   2.3 Research design ......................................................................................................... 9
      2.3.1 Case study ......................................................................................................... 9
   2.4 Data capturing ........................................................................................................... 11
      2.4.1 Selection ........................................................................................................... 11
      2.4.2 Interview ......................................................................................................... 12
      2.4.3 Interview procedure ...................................................................................... 13
   2.5 Data analysis ............................................................................................................. 15
      2.5.1 Data reduction .............................................................................................. 15
      2.5.2 Data display .................................................................................................... 16
      2.5.3 Drawing conclusions and verifying ................................................................ 17
   2.6 Trustworthiness ......................................................................................................... 17
      2.6.1 Credibility ....................................................................................................... 18
      2.6.2 Transferability ............................................................................................... 18
      2.6.3 Dependability ............................................................................................... 19
      2.6.4 Confirmability .............................................................................................. 19

3. **The connectivity of systems** .......................................................................................... 20
   3.1 Introduction ................................................................................................................. 20
   3.2 Complex systems ....................................................................................................... 20
3.2.1 Complex networks .......................................................... 22
3.2.2 Interdependencies ......................................................... 23
3.2.3 Cooperation ................................................................. 26
3.3 The system of cities .......................................................... 26
3.3.1 Urban agglomerations ..................................................... 28
3.3.2 The importance of flows .................................................. 29
3.3.3 The characteristics of hubs .............................................. 30
3.3.4 The importance of hubs .................................................. 31

4. The case of the Oresund Region ............................................. 34
4.1 Introduction ................................................................... 34
4.2 Hub categorization .......................................................... 36
4.3 Defining hubs empirically ................................................... 37
4.4 Transport hubs ............................................................... 37
4.4.1 Airports ....................................................................... 40
4.4.2 Combi terminals .......................................................... 41
4.4.3 Ports .......................................................................... 42
4.4.4 Train stations .............................................................. 43
4.5 Economic hubs ............................................................... 45
4.6 Infrastructure hubs .......................................................... 45
4.7 Feeder lines .................................................................... 46
4.8 Collaboration in the Oresund Region ..................................... 47
4.9 Mapping the hubs ............................................................ 48
4.10 Outcomes of the interviews ............................................... 49
4.10.1 The hub concept .......................................................... 50
4.10.2 Vital hubs in and for the Oresund Region ......................... 50
4.10.3 Dependencies .............................................................. 53
4.10.4 Collaborations ............................................................. 55
4.10.5 Networks .................................................................... 56
4.10.6 Urbanization effects ..................................................... 58
4.10.7 Obstructions ............................................................... 60

5. Vital hubs in the Oresund Region .......................................... 62
5.1 Systems of hubs .............................................................. 62
5.1.1 The hub categorization model ......................................... 64
5.2 Interconnectivity ............................................................................................................ 68
  5.2.3 The hub relationship model ......................................................................................... 70
  5.3 Collaboration .................................................................................................................. 72

6. Connectivity and collaboration ......................................................................................... 75
  6.1 The most important hubs in the Oresund Region ............................................................ 75
  6.2 The connectivity of the hubs in the Oresund Region ....................................................... 76
  6.3 The collaboration of the hubs in the Oresund Region ..................................................... 77
  6.4 Suggestions for further research .................................................................................... 78

References .............................................................................................................................. 79
  Attendance at meetings ....................................................................................................... 79
  Conferences ....................................................................................................................... 79
  Interviews .......................................................................................................................... 79
  Articles .............................................................................................................................. 80
  Books ............................................................................................................................... 82
  Electronic sources .............................................................................................................. 85
  Reports .............................................................................................................................. 86

Appendix ................................................................................................................................. 89
  Template for the interviews ............................................................................................... 89
  Mapped hubs in the Oresund Region .................................................................................. 90
List of figures

Figure 1 - The components of data analysis ................................................................. 15
Figure 2 - Linear flow chart .................................................................................. 25
Figure 3 - Network flow chart ............................................................................... 25
Figure 4 - Relations of hubs, nodes and feeder lines ........................................... 31
Figure 5 - Hub categorization .............................................................................. 36
Figure 6 - Hub map of the Oresund Region ......................................................... 49
Figure 7 - Systems of hubs imbedded in the systems of cities in the Oresund Region ................................................................................................................. 63
Figure 8 - The hub categorization model ................................................................. 64
Figure 9 - The hub relationship model .................................................................. 71
Figure 10 - The levels of collaboration model ......................................................... 72

List of tables

Table 1 - Flow statistics of the combi terminals in the Oresund Region .................. 41
Table 2 - Flow statistics of the ports in the Oresund Region .................................. 42
Table 3 - Flow statistics of the train stations in the Oresund Region ...................... 45
Table 5 - Overview of the mapped hubs in the Oresund Region .......................... 48
Table 4 - Interviews conducted ........................................................................... 50
1. Introduction

“The 19th century was a century of empires. The 20th century was a century of nation states. The 21st century will be a century of cities.”

Wellington E. Webb, former Mayor of Denver Colorado (IBM, 2009, p. 13)

1.1 Background

The world which we are living in is an immensely interconnected one. This has certainly been proved with the wide impacts from recent disturbances during the winter and spring of 2010. The particularly cold winter in Sweden, with unusual large amounts of snow, caused disturbances with numerous ripple effects and great profit losses. For instance, Green Cargo, the company responsible for the major part of goods transported on railways in Sweden, lost 30-40 million SEK in just one month (dn.se, a). The passenger delays during February and March of 2010 were estimated to have cost 150 million SEK for the customers of SJ\(^1\) and SL\(^2\), and that was just during one day. Every delay hour was estimated to have cost 300 SEK per traveler (nyheter24.se). The air traffic chaos caused by the Icelandic volcano eruption has been considered the worst traffic disturbance since the Second World War (dn.se, b). Not even the 9/11 terror attacks caused the same air traffic chaos and stopped as many flights. During the three days when the cloud of ashes had the biggest impact on the flight schedules, loss of incomes amounted to 400 million USD a day. Not only the airlines were afflicted, but tourists and business travelers were unable to go home and industries suffered from important inputs and key people being stuck in the chaos (di.se).

With companies having adapted their logistic system to a just-in-time delivery, the importance of a well functioning transportation system is crucial (dn.se, b). According to MSB\(^3\), other vulnerable areas include urgent patient transportations and deliveries of spare parts to power and communication networks (svt.se). A malfunction in the communication system can also have substantial effects. Recently an improper anti-virus update knocked out 800,000 computers worldwide. In Sweden 15,000 computers at Telia were shut down and 28 Systembolaget stores were forced to close down their operation. In the US, the effects were even bigger, with important functions in society, such as

---

\(^1\) **Statens Järnvägar**, government-owned passenger train operator in Sweden

\(^2\) **Storstockholms Lokaltrafik**, public transport systems in Stockholm County

\(^3\) **Myndigheten för samhällsskydd och beredskap**, the Swedish Civil Contingencies Agency
the police and hospitals, being affected. In the state of Rhode Island, a hospital was even forced to reject patients (dn.se, c).

The world has not always been this interconnected. Before the Second World War, the world was built upon strong central governments and national economies with well protected borders (Scott, 2001). These formerly vertical structures of the world have been replaced by a horizontal flow structure in a complex and intertwined global economy (Saab, 2008). Over the past decades, national economies have been de-bordered (Scott, 2001), and today, focus is put on promoting the flows of goods, people, capital and services across the borders, as opposed to when flows moved only within national economies (Sassen, 2001). Due to changes in the economy, such as privatization, deregulation and the opening up of national economies to foreign businesses, cities and regions have become important engines in the world economy. They are defined as transaction intensive hubs (Scott, 2001) and function as crossroads of important world-wide processes. Hubs are the connection points in a network where different flows are concentrated and then redistributed (O’Kelly & Miller, 1994). Due to the world’s nature of interconnectivity, these connection points play a vital role in the networks of flows and it is crucial to understand how these hubs function in society.

Today the level of intensity, complexity and the global span of these networks has increased (Sassen, 2001). Modern scholars of urban development maintain that transnational processes have a significant influence on the development of cities (Batten, 1995). In 1950, there were only two cities in the world with more than 10 million inhabitants; New York and London. By 2009, the number had increased to 23 megacities4 (demographia.com). The world is facing a rapid urbanization with half of the world’s population now living in cities. By the year of 2050, the UN estimates that the number will have increased to 70 percent (unfpa.org). A number of cities account for higher GDP than actual countries and many are of highest importance in terms of economic prosperity to their countries (Saab Report, 2009b). During the past century, the number of megacities and global cities5 has increased and the cities are connected in a complex global network of flows. These cities are considered “key nodes” of the international urban system (Camagni, 2001; Batten, 1995), controlling and coordinating flows such as global finances (Thrift, 1986) as well as production and business service (Batten, 1995). These urban agglomerations create a global mosaic that seems to be dominating the world economy (Scott, 2001). Scott et al (2001) maintain that city regions have become central in modern life and that they have emerged as critically important institutional

4 Defined by Pearce, F. (2006) as a city with more than 10 million inhabitants
5 Defined by Sassen, S. (2000) as a city considered to be an important connection point in the global economic system
phenomena in the world. This has led to a reduced importance of protecting national borders and instead cities have entered the scene as key nodes in the complex global flows of goods, people, capital and service (Graham, 2002). The movement of free flows of goods, services, people and ideas across national boundaries are also important driving forces for change (Region Skåne, 2009).

1.2 Problem discussion

This new system of protecting flows, instead of defending borders, has created a need for studying cities from a different perspective. When trying to attain economic growth and prosperity in a city, the ability of attracting flows such as people, goods, capital and service, is fundamental. Thus, understanding how cities are governed could also entail understanding how urban flows are managed. While keeping flows running efficiently and stably, there is a need of understanding the logistic and transport movements in a city in order to optimize and control them in a way that strains the infrastructure to a smallest possible extent.

Globalization has brought about many changes throughout the world. One change is how an increasing number of people are moving from rural areas into cities (unfba.org). Along with a rapid increase of the world population, issues of sustainability arise through the compression of people, resources, goods and capital (FMER, 2004). It is important to keep in mind that when cities grow so does their level of complexity and vulnerability. Making sure that the flows run frictionless is, to say the least, a huge challenge. The strains on the infrastructural capacity is increasing and continuous improvements to important infrastructures and transport hubs such as airports, harbors, distribution terminals, railways, energy systems and pipelines are needed.

However, keeping a city running, involves more than simply updating the infrastructure. According to IBM (2009), the operation and development of a city is based on a number of core systems such as city services, citizens, business, transport, communication, water and energy. It is the effectiveness and efficiency of these systems that “determine how a city works and how successful it is at delivering its goals” (IBM, 2009, p. 2). Due to the interconnectivity of these core systems, they must be considered holistically as well as individually.

As cities grow both in terms of number and population they gain more economic and political power than ever before. “Economically, they are becoming the hubs of a globally integrated, service-based society. Politically, they are in the midst of a realignment of power – with greater influence, but also greater responsibility” (IBM, 2009, p. 1). This means that national authorities and governments are
placing more responsibilities on a regional and local level. Major city regions will become important actors, managing their own development within a growing global economy (Ellefsen, 2001; Friedmann, 2001; Nousiainen, 2001).

1.3 Purpose of study

The main purpose of this study is to describe how city regions function from a hub perspective. *What enables the important flows of people, good, capital and services to run through and within city regions? Why are these so important for growth and prosperity and how are the connection points of these flows linked?* By mapping the most important hubs in the Oresund Region we aim to produce a hub identification model and a hub connectivity model, with the possibility of using them on other comparable city regions.

1.4 Research questions

- Which are the Oresund Region’s most important hubs?
- How are the important hubs in the Oresund Region connected to each other?
- How do the hubs in the Oresund Region collaborate with each other?

1.5 Delimitations

The empirical focus of this thesis is on the region of Oresund and more precisely the region around Malmö, Copenhagen and the western part of Scania. The most important hubs in the region were mapped and the flows of people, goods, capital and services were used as a means for indentifying and categorizing the hubs. When it comes to the magnifying hub level, regions or cities could be considered as hubs themselves, but the mapped hubs in this thesis are only those within the cities of the Oresund Region.

A function-based approach was adopted, meaning that only the existence of the hubs will be depicted and not the emergence of these hubs. Finally, although there is an interesting aspect of vulnerability and sustainability associated with the subject, due to the connectivity characteristics of the hubs, these aspects will not be thoroughly investigated.
1.6 Chapter overview

This outline gives the reader an idea of the content of the thesis and what there is to come.

- In research procedure, the methodology with the choice of research approach and design is explored as well as the methods of data collection and analysis. Finally this chapter discusses the trustworthiness of the thesis research.

- In the connectivity of systems, the frame of reference serves as a support when analyzing the empirical research. Characteristics of complex systems and networks, with interdependencies and cooperation are discussed. Important concepts such as flows and hubs are defined.

- In the case of the Oresund Region, the empirical findings are presented. The chapter starts with a background of the Oresund Region to give the reader an understanding of the case of study. Thereafter, information about the different hubs, as well as the outcomes of the interviews, is submitted.

- In vital hubs in the Oresund Region, the empirical and the theoretical findings is analyzed to investigate the vital hubs in the Oresund Region as well as the connections and collaborations between the hubs.

- In connections and collaboration, the conclusion of this thesis will be presented, providing the answers to the research questions, as well as suggestions for further research.
2. Research procedure

“Each choice brings with it a set of assumptions about the social world it investigates and some strategies are better suited than others for tackling specific issues.”

Denscombe (2007, p. 3)

2.1 Introduction

In January 2010, the authors of this thesis got in touch with the corporate group of Saab Technologies and their strategic division of foresight, and the opportunity of participating in a new exciting project was presented. Saab and Trafikverket had previously started a project with the purpose of speeding up the development of intelligent transport systems and create prerequisites for functionality, efficiency and sustainability in the collected transport system of railway, road, sea and air. The objective of that study was to create an analytical model for vital hubs in the city. Our participation in the project was to be extended to a more holistic portrayal taking the concept of hubs further, including not only transport hubs, but other hubs as well.

2.2 Research approaches

When producing knowledge, the right method can be used as guiding principles. These principles need to coincide with the problem that is to be investigated. If not, the researchers run the risk of reaching trivial results and sometimes the method can even work against its purpose. It is important to recognize that the choice of method and research approach will have specific consequences and that being coherent and consistent in each choice is imperative (Arbnor & Bjerke, 1994).

Three approaches serving different purposes have been used throughout this study, all necessary for the thesis. The systems approach was found very suitable, demonstrating that cities are built up by complex systems where the whole is considered greater than the sum of its parts. The inductive approach was found necessary, since new theory covering previous gaps needed to be created. The empirical research therefore carried the research forward. Finally, due to the fact that qualitative research focuses on the natural setting, and fits well with case studies, the qualitative approach was used throughout the research process.
2.2.1 The systems approach

The systems approach views the world holistically with not only the parts considered important but also how they relate to each other. These parts can be explained and understood only in relation to the whole. Reality is assumed to be constructed of complex systems and is arranged in such a way where the whole differs from the sum of its parts (Arbnor & Bjerke, 1997; Lundahl & Skärvad, 1999). As this thesis aims at not only describing the most important hubs of a flow system, but also strives towards depicting the different hub networks holistically, the systems approach seemed fitting.

The technique most commonly used in the systems approach is that of case studies, since complex problems need extensive and in-depth research. For practical reasons there is a need of limiting the number of chosen cases and sometimes focusing on one single case could be the best approach. Cases should not be chosen on the merits of being representative for all other systems, but rather for a certain type of system. The systems approach is compatible with the view of cities being built up by complex systems and the whole being bigger than the sum of its parts. This thesis aims at creating a hub model applicable on other city regions as well, and with a specific system chosen, the possibility of it being representative is higher than for when trying to depict a general system (Arbnor & Bjerke, 1997).

A common way of trying to attain correct measurement within the systems approach is to depict the real system from as many angles as possible. This entails speaking to as many people as possible and studying as much secondary material as possible (Arbnor & Bjerke, 1997). For this study, a number of different people connected to this complex system and its different hubs were contacted and interviewed in order to cover as many angles as possible. When it comes to delimitations, the writers must decide on a magnifying level of the system to be studied. Practical limitations such as time and resources need to be taken into consideration (Arbnor & Bjerke, 1997). Due to time limitations, conducting interviews with all the hub operators was not possible. Instead interviews with different operators working at different hubs, as well as several people considered to be well known with the Oresund Region, were performed in order to create a holistic picture.

2.2.2 The inductive approach

Throughout this study the empirical findings have carried the research forward, implying an inductive study. When using an inductive approach, observations and findings are first taken into consideration and thereafter theory is produced (Bryman & Bell, 2007). An inductive approach is appropriate when
one is more uncertain of relevant relationships, and thus, since our knowledge within the field of study was limited, an inductive approach was adopted. A lot is written about flows and hubs on national and global level. However, on city and region level, little, if any, information is to be found. Furthermore, the concept of hubs was only found within transport theory, creating a need for generating new theory based on the empirical findings in the case of the Oresund Region.

In the systems approach an inductive approach is common when studying relationships, since there is less dependence of theory (Arnbor & Bjerke, 1997). According to Jacobsen (2009) and Merriam (1988), the ideal for an inductive approach would be for a scientist to gather information without having too many assumptions about the problem. However, the inductive process has also entailed theoretical reflections and thus an iterative strategy has somewhat been used. An iterative process is signified by alternating data and theory back and forth (Bryman & Bell, 2007).

### 2.2.3 The qualitative approach

Dey (1993) and Strauss & Corbin (1998) define qualitative research as any research generating results not produced by statistical procedures or means of quantification. This statement also finds favor by Bryman & Bell (2007); Eisenhardt (1989), and Miles & Huberman (1994), who classify a qualitative study as preferable when conducting research more concerned with words than numbers. In a qualitative study, significance is primarily conveyed through language and actions (Denscombe, 2007; Dey, 1993; Jacobsen, 2009).

Marshall & Rossman (2006) state that qualitative research focuses on context and takes place in a natural setting. It is based on the lived experience of people and fundamentally interpretive. Furthermore, the qualitative researcher views the world holistically and uses complex reasoning that is versatile and iterative. According to Miles & Huberman (1994), qualitative data is a source of well-grounded and rich descriptions of processes.

Since the nature of this thesis is complex and among other things in need of a holistic view, a qualitative research approach was found appropriate. Qualitative studies often have a descriptive purpose, with a focus on documenting and describing the phenomenon of interest and showing relationships as perceived by the participants in the study (Marshall & Rossman, 2006). This also fits well with this thesis.
2.3 Research design

According to Philliber et al (1980), the research design entails four specific aspects; problem to study, finding relevant data, data collection procedure and analyzing the result. The research design is a plan of how to carry out the work in these four areas. To facilitate the research process of this thesis, having a carefully prepared research design was considered important. The different implications of a case study was thoroughly investigated and considered a suitable research design.

2.3.1 Case study

The case study is often associated with an intensive examination of a location (Bryman and Bell, 2007) and is often used in social science research, predominantly in relation to the discovery of new information (Denscombe, 2007; Yin, 2007). One of the strengths of the case study design is that it allows the researchers to study the field closely and in-depth (Denscombe, 2007). This is done by using different data collecting methods, as well as numerous sources, such as documents, personal interviews and meeting attendances (Bryman & Bell, 2007; Eisenhardt, 1989; Ferreira & Merchant, 1992). Case studies actually encourage the researchers to use a variety of methods in order to be able to describe the complex field of study (Arnbor & Bjerke, 1997; Denscombe, 2007). Furthermore, a case study is often associated with an inductive and qualitative research approach (Lundahl & Skärvad, 1999; Merriam, 1988).

Case studies are often used when trying to understand contemporary social phenomena (Merriam, 1988; Yin, 2007) and can be used to generate theory (Eisenhart, 1989). Social relationships and processes are often interconnected in complex patterns and the case study approach is appropriate since it allows the researchers to conduct in-depth research as well as a holistic analysis (Denscombe, 2007; Lundahl & Skärvad, 1999; Yin, 2007). Furthermore, the case study approach allows the researchers to focus on real tasks and processes in its natural environment and not in an artificial situation created for the research purpose only (Ferreira & Merchant, 1992).

Since the aim of this thesis was to investigate a city region intensely in order to answer the research questions, a case study design was adopted (Bryman & Bell, 2007; Patton, 2002; Hartley, 1994). A case study design is appropriate when investigating a unit (Denscombe, 2007; Yin, 2007) and when the writers have limited knowledge within the field of study (Patton, 2002), or where the researchers
have little control over events (Denscombe, 2007). Lundahl & Skärvad (1999) and Miles & Huberman (1994), mentions a geographical area as an example of a case study.

Case studies can entail either single or multiple cases (Yin, 2007) and all case studies need to be chosen on the basis of the relevance to the practical problems or the theoretical issues being researched (Denscombe, 2007). The purpose of this study was to describe a contemporary social phenomena and the complexity of the problem led to a single-case adoption. A single-case study is fitting in several instances and the most common validation for it is the typical case, with the possibility of generalizing the findings and applying them on other cases (Yin, 2007; Denscombe, 2007).

Urban agglomerations, which are flow intensive and facing an increasing number of inhabitants, serve as an inspiration for this thesis. Therefore, a case study on the Oresund Region with a hub perspective was chosen as a suitable single-case study object. The Oresund Region was chosen deliberately on the basis of its specific attributes and the fact that it is the most densely populated region in Scandinavia, with 3.7 million inhabitants, producing 25 percent of Sweden and Denmark’s total GDP (oresundskomiteen.dk). Furthermore, the Oresund Region is a suitable case as it connects two countries through the Oresund Bridge as well as contains important transportation hubs. With a high number of capital transactions, in-migration, commuters and important transits, the Oresund Region counts as the most flow intensive region in Scandinavia (Johansson, Saab Technologies and City planning office of Malmö) and is therefore an appropriate city region to base this study on. Several major transport routes go through the Oresund Region, connecting Sweden with Denmark as well as the European continent. Since this thesis aims at creating a hub model applicable on other cases, a single-case study with the possibility of generalizing the findings was chosen.

One of the dangers of conducting a single-case study is however that it might be difficult to generalize the information and apply it on other cases (Denscombes, 2007). Single-case studies are often carried out on an abstract level and in order to avoid conveying an inaccurate representation of the case, thorough review is necessary (Yin, 2007). Although the findings of a single-case study most often are unique to the particular circumstances of the case investigated, it could still work as an example in a broader sense. How far one can draw conclusions from a single-case depends on the extent the case study is similar to comparing cases. Comparisons might call for physical locations such as regions, social locations and institutional locations (Denscombe, 2007). When generalizing and drawing conclusions from this case, the comparing cases need to have similar prerequisites as the Oresund Region.
2.4 Data capturing

When collecting data, there are two main categories of techniques. There is using previously collected material, so called secondary data, and there is collecting new data, so called primary data. Secondary data can be essential for breadth and primary data can lead to a deeper perspective (Arbnor & Bjerke, 1997). In regards to this thesis, primary data of interviews was collected and secondary data of articles, books and reports was reviewed. Due to the fact that qualitative researchers often have to handle great quantities of data (Holme & Solvang, 1997), the structuring of that data is highly important (Miles & Huberman, 1994). This will be further discussed in the paragraph of data analysis.

2.4.1 Selection

When performing a case study with a qualitative approach, several things need to be considered. It is important to reflect on the reason for selecting a specific case and the different respondents. The Oresund Region was recognized as a suitable case due to its flow-intensive characteristics. The structure and location of the area was also found very interesting, with a possible result corresponding to the research questions of the study.

When selecting the respondents, qualitative researchers usually work with small samples of people and study them in-depth (Miles & Hubermann, 1994). The samples chosen should address the purpose of study (Holme & Solvang, 1997) and when deciding the number of interviewees, King (1995) mentions time, as well as the resources available, as critical factors. Marshall & Rossman (2006) recommend interviewing “elite people” that are influential, well-known and well-informed in their organization or community and to select those with expertise within the area of research. By interviewing elite people, important information can be acquired. However, the biggest disadvantage is that it is often difficult to gain access to these elite people. In this thesis, people representative to the field of study were interviewed. These were mostly operating managers at the mapped hubs, city planners and scientists within the area of research, and most of these were considered elite people. Marshall & Rossman (2006) and Yin (2007) claim that interviewing key people is crucial for the success of a case study, since these respondents often provide important information of the particular case. Holstein & Gubrium (2004) perceive respondents as holding beneficial facts, reflections, opinions and other traces of experiences.
When selecting data, Miles & Huberman (1994) elaborate on a within-case study sampling. Talking to people, reading documents and picking up artifacts could lead researchers to new information. This was found true in this research study, with several key people chosen on the basis of being referred to by other interviewees. In order to determine which hubs were important, a number of flow characteristics, such as flow intensity and importance for the Oresund Region, were considered. Research as well as contacting people within the field of study led us to mapping these important hubs, as well as the hubs’ operating managers. Other important actors were identified through participating at conferences and meetings. Marshall & Rossman (2006) state that the energy coming from a high level of personal interest could be infectious and useful when seeking access. A great interest in the field of study was found among the participants of the study, which facilitated setting up meetings and interviews.

2.4.2 Interview

One of the most important and widely used data collecting methods within qualitative research is the interview (King, 1995; Marshall & Rossman, 2006; Yin, 2007). Interviews carried out in a qualitative case study are used to investigate the special circumstances and the relations within the context of a phenomenon (Hartley, 1995). The strength of the qualitative interview is that it allows the researchers to study the situation in its everyday environment and conduct casual conversations with the participants (Holme & Solvang, 1997). Information exchanged through personal contact has a richer content according to Hallowell (1999), since the interviewer for instance can observe the interviewee’s voice tone, expressions and body language. However, interviewing also has limitations and weaknesses. Since they involve personal interaction, cooperation is vital. The interviewees might not always be obliged to share information or may not possess the knowledge, which the researchers seek (Marshall & Rossman, 2006).

In order to obtain the empirical information for this thesis, semi-structured interviews with relevant people were carried out. The semi-structured interview is suitable when acquiring qualitative data (Lundahl & Skärvad, 1999), since it allows the interviewer to follow a list of issues that needs to be covered and still be flexible, allowing the interviewee to speak more freely around certain issues (Bryman & Bell, 2007; Denscombe, 2007; Ghauri & Gronhaug, 2005; Lundahl & Skärvid, 1999). The interview method takes into account what the interviewee sees as important to discuss (Bryman & Bell, 2007) and is most appropriate when factual information needs to be collected. However, there
is uncertainty on how much information participants will be able and willing to contribute with (King, 1995).

Using semi-structured interviews allows the interviewer to create new questions during the interview that are more targeted to the discussion with the interviewee. In the implementation of semi-structured interviews it is of importance to create a pleasant chemistry between the interviewer and the interviewee. Throughout the interview one should avoid controversial background questions and give the interviewee main areas to cover (Lundahl & Skärvad, 1999). Every interview question should be determined thematically and contribute to more knowledge, but also dynamically, creating a pleasant atmosphere between the interviewer and the interviewee (Kvale, 2008). While conducting the interviews for this thesis, some questions had to be covered and therefore semi-structured interviews were carried out. The interviewees were left time to discuss the themes which often led to new and interesting information.

One advantage with the semi-structured interview is the direct focus on the case study questions and the fact that it provides insight. However, one disadvantage with the semi-structured interview is that the answers might be too comprehensive and nuanced (Yin, 2007). Holstein & Gubrium (2004) explain that the challenge lies in extracting information without changing the content. This can be done through adopting various degrees of standardization when carrying out the interviews. This is why a template of chosen questions was created before conducting the interviews.

2.4.3 Interview procedure

When conducting face-to-face interviews people often find it easier to share sensitive information, since a personal contact is being established with the interviewer (Bryman & Bell, 2007). This was considered in this thesis, with nine out of twelve interviews conducted being face-to-face and the rest over telephone. Lundbladh & Skärstad (1999); King (1995) and Kvale (2008) highlight the importance of creating a personal contact and good chemistry with the interviewee. Dalen (2008) and King (1995) demonstrate the importance of the initial questions being of neutral character, so that the interviewee feels relaxed. Jacobsen (2009) maintains that the absence of personal contact can impact the interviewee in the sense that it becomes easier for the interviewee to modify the truth. Furthermore, conducting a personal interview allows the interviewer to observe the interviewee’s body language and thus for instance can judge when the interviewee does not understand a certain question. Jacobsen highlights the importance of conducting the interview in a
neutral setting, where the interviewee can feel relaxed and the interview can proceed without disturbance. Due to this fact, all face-to-face interviews were conducted at the interviewees’ offices. The advantage of carrying out face-to-face interviews became obvious when conducting telephone interviews. Because of the complexity of the field of study, it was difficult for those interviewed by telephone to understand the hub concept. Furthermore, during the face-to-face interviews a positive personal contact was created and the interviewees were open and free-spoken in their responses. The same personal contact was not achieved during the telephone interviews. Due to these reasons, the number of telephone interviews was kept to a minimum. Explaining the hub concept of this study, people within the transport industry understood the concept easier than some of the other interviewees. The interviews were on average between 30 minutes and two hours long. Since there were always two interviewers, one could take notes, while the other was free to lead the interview. The possibility of follow-up questions was given by all the interviewees, which was later found useful.

2.4.4 Choice of theory

Theory is most often used as a tool to explain observed regularities (Bryman & Bell, 2007). Qualitative case studies are often applied to create and construct theory. Depending on the level of knowledge, as well as the quantity of the theory, a case study can be used to test, clarify, refine or even develop new theory. A great part of the research is guided by existing theories within the field of study and derivations are made from existing theories to the empirical results. Theory could thus become a framework of what information has to be gathered and the empirical results are then used to prove or reject the theory (Merriam, 1988). Glaser & Strauss (1967) point out the importance of using existing theory as a source of inspiration to generate new suppositions. The process demands a flexible interplay between theory and phenomenon. In order to ensure the quality of the choice of theory, this study contains theories derived from academic journals and literature. Since the field of study is fairly unexplored, there is a limited quantity of theory available. In this study, the choice of theory is used to explore and develop the complexity and level of dependency between the hubs, as well as refine the existing hub concept. Through participating at several meetings and conferences regarding city planning and logistics, key words were identified and served as a source when searching for relevant theory. These theories were then discussed with different university professors in Copenhagen, Linköping and Norrköping in order to reduce irrelevant ones for this thesis.
2.5 Data analysis

Patton (2002) states that qualitative analysis involves transforming data into findings. Marshall & Rossman (2006) claim that the most intellectual challenging phase of data analysis is to indentify relevant patterns and that the process of generating categories involves noting patterns evident in the settings expressed by the participants. Miles & Huberman (1994, p. 10) define qualitative analysis as “consisting of three concurrent flows of activity: data reduction, data display and conclusion drawing/verification”. The analysis process of this thesis will be presented through Miles and Huberman’s three components of data analysis, illustrated in figure 1. These three components are interwoven continuously throughout the thesis process and will be explained further in respective paragraph.

2.5.1 Data reduction

Data reduction is an important part of analysis and involves sharpening, sorting, focusing, discarding and organizing data in such a way that final conclusions can be drawn and verified. Field notes and interview transcriptions are examples of qualitative data that need to be reduced and transformed, usually by selection, summary, and drawing patterns. Data reduction takes place continuously throughout the whole research process. Before data is actually collected, an anticipatory data
reduction occurs when the researcher selects conceptual framework, case, research questions and
data collecting methods. During the data collection additional reduction of data is carried out, with
summaries, data coding and division making. The data reduction then continues after the fieldwork
until the report is finalized (Miles & Huberman, 1994). Throughout this thesis, data reduction has
been carried out continuously, from the selecting of case, research questions and methods; to the
selection of interviewees and data collection; and finally when writing the report. An extensive
amount of data has been reviewed during the data collecting process. A part from academic journals
and books dealing with the theoretical issue of the thesis, numerous reports and articles about the
Oresund Region have been reviewed. Participating in two conferences in reference to city planning
and logistics also provided a lot of interesting data. However, due to the necessary delimitations,
compelled by the thesis conditions, substantial quantities of data needed to be reduced. Field notes
from conferences, meetings and interviews were also downsized during the process of data display
and drawing/verifying conclusions.

2.5.2 Data display

The second activity flow of data analysis is data display, characterized by organizing a dense
collection of information in order to facilitate the researcher’s conclusion drawing and verifying.
Human beings are in general not good at assimilating large amounts of information. Deciding which
information should be presented, and in which form, is therefore an important analytical activity.
Matrices, graphs, charts and networks are designed to assemble organized information into an
immediate, accessible and compact form in order to make it easier for the analyst to draw justified
conclusions (Miles and Huberman, 1994). Mapping out and categorizing the different hubs served as
a data display and was crucial in order to handle the great amount of information gathered. The four
flows of people, goods, capital and service served as a foundation in identifying important hubs in
the Oresund Region. By mapping these hubs and structuring them after their flow characteristics, the
hub categorization model was able to be created. The data provided by further research and
interviews with numerous people related to the different hub categories was also structured. The
data display of the hub connection was later transformed into the hub relationship model. The hub
map and the hub categorization and hub relationship models are examples of charts and networks
used to facilitate the analysis process and allowed the researchers to distinguish patterns of
dependencies and interlinkages between the different hubs.
2.5.3 Drawing conclusions and verifying

A qualitative analysis needs to be documented in order for the researchers to be able to reflect and refine the methods and make them more generally usable. The third flow of activity in the components of data analysis model is drawing conclusions and verifying data. During the data collecting process, the researcher usually starts deciding what different findings mean by noting regularities, patterns and configurations. Although, conclusions are often prefigured from the beginning, the final conclusions might not appear until all data is gathered. Throughout the research process, conclusions are verified as the researcher proceeds and the implications of the data collected are tested. Without this verification the results will merely be stories of unknown truth and value. The extensive research carried out before initiating the interviews, was an important step in drawing conclusions and verifying. With a somewhat prefigured draft of the research question findings, it was possible to use the interviews to verify and draw new conclusions. The three streams of data; reduction, display and conclusion drawing/verifying are interwoven throughout the research process (Miles and Huberman, 1994). Carrying out this study, a cyclical process of data collection, reduction and display was followed in order to be able to draw conclusions in the end. Although, some results were prefigured already during the implementation of the study, significant outcomes were not established until all information had been processed.

2.6 Trustworthiness

According to Marshall & Rossman (2006) and Yin (2007) the trustworthiness of the research findings are evaluated based on certain criteria. Lincoln & Guba (1985) state that these criteria establish the truth value of the study; its applicability; consistency; and neutrality. Although some authors have other denotations (internal validity, external validity, reliability and objectivity), Lincoln & Guba’s (1985) criteria and definitions of trustworthiness have been adopted in this thesis, due to the appropriateness with qualitative studies. With the chosen research design the aim is to describe rather than analyze, interpret rather than measure and the belief that complete objectivity is impossible was a strong influence throughout the research (Denscombe, 2007).

According to Yin (2007) one of the strengths of the case study approach is that it encourages the use of multiple sources. Although the use of different data, theories and methods is important, without comparing and contrasting them, the study is less likely to gain the desired trustworthiness (Denscombe, 2007). When triangulating data, theories and methods, more comprehensive and
trustworthy knowledge about the object is created (Miller & Fox, 1997). Finally, as Patton (2002, p. 223) claims, “there are no perfect research designs; there are always trade-offs”. The key is to be aware of the strengths and weaknesses of each choice in order to preserve the trustworthiness of the study.

2.6.1 Credibility

The credibility of a research depends on how acceptable the research findings are in the eyes of someone else (Bryman & Bell, 2007) and to what extent the findings were appropriately identified and described (Marshall & Rossman, 2006). One way to ensure credibility is to conduct the research according to certain guidelines and to let the interviewees read the study and confirm correct quotation (Denscombe, 2007; Holme and Solvang, 1997). In order to avoid misrepresenting the respondents and to ensure creditability of the study, all of the interviewees were asked to read the outcome of the study and to give their approval.

2.6.2 Transferability

To generalize the findings of a qualitative study to other settings may be problematic (Lundahl & Skärvad, 1999). Marshall & Rossman (2006) mean that no qualitative studies are generalizable in the probabilistic sense, but that the findings may be transferable. The question of transferability is more how well the findings can be useful to others in similar situations with similar research questions (Denscombe, 2007 and Marshall & Rossman, 2006). Cases should not be chosen on the merits of being representative for all other systems, but rather for a certain type of system (Arbnor & Bjerke, 1997). Depending on the different circumstances of these other cases, the findings of this thesis could be more or less transferable. When transferring the results from this case to other cases it is important to recognize the specific prerequisites. The Oresund Region has specific characteristics that if not matched by the other cases might jeopardize the transferability. For instance, the location of the Oresund Region makes ports important hubs and this would most certain not be found true for a region without surrounding water. There are numerous examples of how the matching of the prerequisites is important for the transferability, which indicates that transferring the findings of this study to another case must be done by attentiveness to the specific conditions. Lundahl & Skärvad (1999) state there is an analytical generalizability of case studies, with the possibility of generalizing the findings in order to create theories, see patterns and exploit earlier theories as a point of
One way to enhance a study’s transferability is to triangulate multiple sources of data. In this study, a triangulation of data was performed by interviewing people within different fields, trying to cover the area investigated. Whereas the majority of the interviewees were chosen on the merits of being a hub operator, several people were also chosen to provide the study with an overview.

2.6.3 Dependability

The level of dependability of is how well the reader can be reasonably sure that the findings would be replicated if the study was conducted by other researchers, with the same participants and the same context (Denscombe, 2007). Bryman & Bell (2007) state that the reader should be able to follow the research procedures and that is something that has been considered when writing this thesis. To enhance dependability of the study the researchers can take assistance of colleagues in evaluating chosen and practiced methods. In producing this thesis, feedback from fellow thesis writers as well as academic and corporate advisors was provided.

2.6.4 Confirmability

The issue of objectivity concerns the extent to which qualitative research can produce findings that are free from the influence of the researchers (Bryman & Bell, 2007; Denscombe, 2007). Confirmability however, presumes that complete objectivity is not achievable in social studies (Bryman & Bell, 2007) and that the researcher’s identity, values and beliefs not entirely can be eliminated from the process of analyzing qualitative data (Denscombe, 2007). To enhance the confirmability the researchers should avoid neglecting data that do not align with the analysis and check rival explanations (Denscombe, 2007). This was reflected upon throughout this study.
3. The connectivity of systems

“No man is an island, entire of itself; every man is a piece of the continent, a part of the main; if a cloud be washed away by the sea, Europe is the less [...] any man's death diminishes me, because I am involved in mankind.”

John Donne (1624)

3.1 Introduction

The 16th century poem by John Donne has worked as an inspiration for many scholars. Amin & Horowitz (2008) use it to describe complex and interactive networks and systems, which humans are interconnected with. Håkansson & Snehota (1989) explain to what extent a single business can be defined as a confined entity, or in other words, an island. Looking at businesses as parts of the whole became popular during the 1970’s and 1980’s. Empirical studies showed the existence of more or less continuous business relationships (Håkansson & Snehota, 2006). Individual organizations are a part of their environment and thus are constrained by the rules of society. Richardson (1972) originally pictured organizations as islands of planned coordination in a sea of market relations. Later on he found this to be a misleading explanation of reality. In theory, organizations are undeniably islands, defined as independent units. However, the arrangements between organizations are in reality complex and they are linked together in patterns of coordination and affiliation. Håkansson & Snehota (1989) and Thompson (2003) come to the same conclusion; individual organizations are not free units, but rather dependent ones, conditioned by other complex social units on whom the organization depends on.

3.2 Complex systems

Technical systems are defined as disordered, complex, problem-solving components, both socially constructed and society shaping (Hughes, 1989). Systems are tightly or loosely connected parts of components that together form a whole and the dependencies between the components are strong (Coward & Salingaros, 2004; Summerton, 1998; Thompson, 2003). Because each part contributes in some way as well as receives something from the whole, they are in turn interdependently connected to the larger environment. Systems consist of components, which cooperate in order to reach a common goal and the systems approach is a way of describing these whole systems and their
components (Churchman, 1973). Hughes (1989) argues that inventors, engineers, managers, financiers, industrial scientists and workers are components in a system. According to Coward and Salingaros (2004), a structure that is easily divided into separate units is not a complex system, but an agglomeration of units. A system is always embedded in a larger system; the bigger the system the more interaction between its parts (Churchman, 1973).

Since systems contain variables which are subjected to unpredictable influences, they are difficult to comprehend. If dysfunctional parts are not adjusted or disengaged, the whole system will degenerate. Systems seek to become self-stabilized. In case of disturbances, the relationship between the parts will keep the system viable. A number of fluctuations are patterned which makes it possible for systems to automatically forecast and adjust the flows. Some days are more flow-intensive than others, and for instance organizations within banks, post and travel have been able to adjust to the fluctuations by recognizing the patterns. Some fluctuations or disturbances are not predictable and these can severely interfere with the orderly operation and reduce the total performance of a system (Thompson, 2003).

Large technical systems of today develop in accordance with loosely defined patterns. According to Hughes (1989) systems can be divided into seven phases: invention, development, innovation, transfer, growth, competition and consolidation. These phases occur throughout the history of the system, however not necessarily in this order. More often it takes several decades to develop new components and subsystems, which in turn have a life span of up to half a century or more. With the IT system being an expectation, big changes of technical systems takes several decades to realize. A common mistake when creating systems is of focusing mostly on current and not future needs. Furthermore, administrators seem to believe that the system will be engineered for them and do not take an active role in its design (Churchman, 1973). Blomkvist & Kaijser (1998) claim that big changes of technical systems need not only long-term perspective, but also a holistic picture.

The systems in which we are living are far too complex for us to understand and the systems approach is an ongoing debate on different ways to perceive society (Churchman, 1973). With the increased complexity of systems, the problem of control as well as the number of components has increased (Hughes, 1989). Most city administrations do not have a satisfactory system perspective with important city operations being divided into different departments and authorities with no mutual governance. This city division creates rigidity in the system, making city administration more difficult every year (Churchman, 1973; Hughes, 1989). Hughes (1989) argues that inventors, organizers and managers of technological systems often prefer the hierarchical structure. This leads
to a hierarchical structure of the system over time. There is a limit of the level of control by the human operators on technical systems. The environment surrounding the technical system often consists of intractable factors which are not under the control of the system managers. Technical systems constitute of more than just technical components. There are a great number of actors and organizations developing and operating the systems and institutions and sets of regulations that form the framework of the operations (Hughes, 1989; Summerton, 1998). Nielsen (1999) exemplifies these actors of different levels as legislators, regulators, planners, operators and contributors. Every system is an integrated part of the society in which it is developed. Many different factors such as political processes, economic consideration, organization interests, institutional regulations and cultural values affect how the systems are formed, developed and changed (Summerton, 1998).

Summerton (1998) maintains that technical systems are important for Western societies to function. Technical systems, consisting of lots of technical and organizational units, needs momentum. The large mass of a technological system often occurs from the organizations and people committed by several interests to the system. There is a high technological vulnerability connected to the strong dependence of every day usage of electricity, heating, water and transport. Furthermore, there is an invisibility of systems, with most of us not even realizing they are there until something happens. Technical components, organizations and businesses are connected to each other in a complex interplay. If a component is removed or altered, other artifacts in the system will be affected (Hughes, 1989). The problems of a system are intertwined in a way the solution for one problem often will have great impact on solving another (Churchman, 1973). There is a probability of systematic interaction between different policies, with a change in one policy changing the policy of others (Hughes, 1989). To measure the performance of a system in economic terms could be reasonable according to the system analyst. The world which we are living in is one where economic culture and money plays a dominant role (Churchman, 1973).

3.2.1 Complex networks

Law (1989) argues that different components make up a network and that these are difficult to hold in place. These complex interactive networks are important for the economic and social well-being in society. The networks’ nature of interconnectivity makes them more vulnerable to failures. In case of failure, consequences can be widespread with numerous ripple effects. In order to manage disturbances in complex interactive networks, it is important to have a basic understanding of the true system dynamics. There are many challenges that occur in interactive network systems. One
example is the increase of the number of possible interactions due to the growth of participants (Amin, 2000).

Amin (2000) claims that in order to model these complex interactive networks, the bounded rationality of the actual human thinking needs to be examined. Complex interactive networks can be seen as multi-layered and multi-intertwined grids. Law (1989) maintains that if a component does not influence the network in a noticeable or individual way, it is not a part of the network. This highlights the fact that the choice of network which to focus on becomes important, since every network will show its structure. One way of solving this issue is to conduct the same analysis for all components in the system.

Amin (2000) states that energy, communication, transportation and financial infrastructures are becoming increasingly interconnected. This interconnectivity poses new challenges when trying to maintain a secure and reliable management. All of these infrastructures are in themselves complex networks characterized by many points of interactions including stakeholders, data and information. Furthermore, infrastructure networks consist of several functional, operational and management levels. The stakeholders function together in a network and are considered complex since the number of interactions rises at a higher rate than the number of members in the network. Functions in a complex interactive network, which interact with other users and other networks, create additional complexity since the interaction of their elements increase the number of possible outcomes. Today there is no single entity that has complete control over all these highly interactive networks or has the ability to evaluate, monitor and manage the networks in real time (Amin, 2002).

### 3.2.2 Interdependencies

According to Thompson (2003), there are different types of interdependency constellations. An organization which is assumed to be composed of interdependent parts is not necessarily dependent on each part in the system, or for that matter supporting all parts in a direct way. However, the parts are interdependent in the sense that unless each performs adequately, the total system might be jeopardized. This follows that failures of one component endangers the whole, which in turn each part is supported by. This is defined as pooled interdependence. The second form of interdependence is serial interdependence, where the parts of a system are affected in a sequential order. This is called sequential interdependence. A third form of interdependence, reciprocal interdependence, is when each unit involved is influenced by the other. There is a joint
interdependence between the parts. All organizations have pooled interdependence, whereas the more complicated organizations have a mixture of sequential as well as pooled interdependence. The most complex organizations have a combination of reciprocal, sequential and pooled interdependence. There are three levels of coordination, which are connected to the three levels of interdependence. Uncomplicated organizations are coordinated through standardization, with established routines or rules for each unit consistent with those taken by others in the interdependent relationship. More complicated organizations use coordination by plan, with governed schedules for the interdependent units. The most complex organizations use coordination by mutual adjustment, often involving coordination across hierarchal lines. The three types of coordination require different levels of communication and decision-making, where complex systems, with reciprocal interdependence and mutual adjustments, call for the highest level.

Today, almost all economies and social functions depend on the secure, reliable operation of different infrastructures. These infrastructures have contributed to the good life that the developed countries in the world have. However, with time these infrastructures have grown more complex handling a great amount of different demands and they have also become more interdependent (Amin & Horowitz, 2008). A number of interdependences are obvious such as many functions’ dependency on electric power. However, in many cases the interdependencies are not as visible (Little, 2002).

Systems have spatial spreads regardless of their specific design and have the characteristics of enabling other systems. Electricity, for instance, is a prerequisite for other technical systems, such as transport and telecommunication. Furthermore, systems do not only contain organizations that own, operate and regulate their parts, but also those using the services and products that the systems provide. According to Summerton (1998), there is much research within the field of study, especially about “classic infrastructures” such as transport systems (air, train, road and sea traffic), telecommunication (telephone and computer communication), energy systems (gas, heating and electric systems) and water supply systems (water and sewage).

Telecommunication is an example of an interdependent infrastructure function. Among other things, the dependence on telecommunication has increased the demand for reliable and disturbance-free electricity. At present many functions in society such as the banking and financial systems depend on electric power and telecommunication systems. The transport system is dependent on communication and power as well. The strong interdependence that exists today between the different flows and hubs means that a problem occurring in one part of the infrastructure network
can have a great impact on other parts. There is a risk of ripple effects, both within the same network as well as spreading to other networks (Amin & Horowitz, 2008). An outage in one infrastructure will also have an impact on other infrastructures due to interdependency. The degree of disturbance depends on how tightly coupled the infrastructure components are (Little, 2002).

System analysts often use flow charts to show the connections and dependencies within systems. Linear flow charts are suitable for simpler systems, whereas complex systems require complex flow charts, for instance network flow charts. Figure 2 and 3 depict the system of a hospital where the network flow chart is the more realistic one. The arrows specify the flows of people between different stations or hubs in the system, depicted by the lettered circles. In systems it is desirable to have as even flows as possible and modeling the movements in a network could be done by using these kinds of charts (Churchman, 1973). Figure 3 illustrates that there is often not a straight line from origin to destination.

![Figure 2 - Linear flow chart, adapted from Churchman (1973, p. 131)](image)

![Figure 3 - Network flow chart, adapted from Churchman (1973, p. 131)](image)
3.2.3 Cooperation

According to the EU organization of Eurocities (2007), the problems cities are facing are in need of complex solutions, requiring continuous collaboration between the different levels of governance such as local authorities, regions, member states of the European Union and the European Commission. Nousiainen (2001) states that numerous networks of cities, regions and private organizations have emerged in order to promote cooperation, with attempts of organizing or reorganizing structure, going beyond inter-municipal cooperation. With the threat of increased competition between cities and regions, after the inauguration of the single market within the European Union, a need of further cooperation has emerged.

In Denmark, the governance and planning of cities are a municipal responsibility. The state and its counties are somewhat involved in the urban planning but the local municipalities are responsible for development, planning and regulation. In order to facilitate regional cooperation and integration, transport connections have a vital role (Nousiainen, 2001). Eurocities (2007) highlights the importance of creating efficient links for both passengers and freight. Furthermore, transport and city planning are linked by a large number of different networks, with transport operators being important in town-planning.

Technical infrastructure must be seen as socio-technical systems, consisting not only of technical components but of social, cultural and economic components as well. When approaching the networks as socio-technical systems, the object of the investigation becomes more realistic but also more complex and the borderlines more difficult to define (Nielsen, 1999). Keating (2001) argues that the development of coalition also depends on culture, institution, leadership, social compositions and external relations. Thompson (2003) claims that organizations crossing national borders tend to establish region-based and semiautonomous divisions, due to the strong variations between countries. Regional divisions are often decentralized in a dynamic environment. This new form of urban agglomerations has changed the traditional hierarchy of local, regional and national levels of power (Joye, 2001).

3.3 The system of cities

The population density of urban areas is becoming increasingly congested. The amount of megacities and large urban agglomerations has grown significantly in the last couple of years. In 1950, only two
cities; New York and London had passed the limit of 10 million inhabitants. By 2020, the number is expected to have increased to 30 megacities in the world (Amin, 2000). Scott et al (2001) maintain that there are more than 300 city regions today with a population exceeding one million inhabitants. Large cities have a higher ranking level within global city networks and a higher level of perceived quality life (Hoyler et al, 2008), but they also put stress on the infrastructure (Amin, 2000). Present day cities can be defined as socio-technical constructions supporting flows of people, goods, service, information, capital, waste, water and meaning to different destinations (Graham, 2002). Scott (2007) defines the city as a dense, polarized system of interacting social and economic phenomena. Amin and Thrift (2002, p. 70) maintain that “cities are if nothing else, agglomerations of people, buildings, technologies, offices, homes, parks and services”. Ellefson (2001) states that the process of regionalization extends the functionality of urban regions. The integrating of different cities into an urban regional system increases the need for functional mobility. The author maintains that within the city there also exists a system of nodes and that cities can be viewed as series of systems overlapping with other systems. When adopting technical systems in mega urban regions, sustainability is considered an important criterion. Because of the density, megacities face specific challenges in the areas of public and personal transport, communication, energy supply, water supply, construction and housing (FMER, 2004).

Coward & Salingaros (2004) explain that goods are moved, consumed, changed, combined and created in cities. Pile (1999) claims that cities are dense areas with concentrations of people, things, institutions and architectural forms. Furthermore, cities hold a place in different networks of communication and flows run through and beyond cities. Castells (1996) maintains that technological and economic integration, or what can be considered as the “space of flows”, occurs in almost every city. Urban spaces are constructed as socio-technical points that organize and manage the fast shipment of goods, freight and people with a variety of transportation modes to more or less distant destinations (Graham, 2002). Coward & Salingaros (2004, p. 109) describes a successful city as “one in which even simple movements are a rich and rewarding experience”. The authors maintain that it is difficult to decide which changes city modules and networks needs. Urban change must instead be a built-in function, driven by complex patterns of exchange of information.

Haughton (1999) maintains that a sustainable city is one that contributes effectively to the global aims of sustainable development, where sustainable development is seen as an end-product. In an intertwining global economy it is meaningless to attempt to create a sustainable city in isolation from its broader hinterland area. Eurocities (2007) claims that sustainable mobility is necessary for economic growth and that accessible cities are important in order for people and goods from
surrounding regions, as well as within the city, to reach their destination. Traffic congestion and lack of access will hinder economic growth and deny citizens different benefits in terms of employment and prosperity. Hesse (2010) highlights the role of urban places and their ability to attract, manage and redirect flows in networks. There is a certain dependence of connectivity, which becomes increasingly important for inter-urban competition. Cities and regions have always been important nodes for the exchange of people and commodities, ideas and innovation, functioning as engines of economic growth on a regional as well as on a national level (Eurocities, 2007). Amin & Thrift (2002) define cities as central points in knowledge-based urban agglomerations, with strong internal flows of knowledge. According to Jakobsen & Onsager (2005), cities are structured around flows of people, information and money, and are assemblages of economic relations of greater or lesser levels, which have different intensities at different locations. The civil infrastructure has been an important economic engine of power and thus has been a crucial factor for the economic welfare of nations. The modern nations depend on the ability to move goods, people and information. Therefore it is of importance for the government, the business life and the public in general that the flows of services provided by the infrastructure in the country works efficiently (Little, 2002).

### 3.3.1 Urban agglomerations

Hoyler et al (2008) write about a new type of urban form which has been given numerous names; multi-core metropolis, polycentric urban regions, mega-politan areas, mega-regions, mega-city regions. Urban agglomerations are both an outcome as well as an instigator of globalization. They are also considered crucial motors of the global economy (Scott et al, 2001). Ellefsen (2001) believes in a future Europe composed of large diffuse agglomerations, linked together by systems of production and transportation. In this thesis, urban agglomerations are seen as a concentration of cities within a geographical region, such as the Oresund Region.

Urban agglomerations are becoming increasingly polycentric, whereas in the past focus was put on a small number of central cities (Scott, 2001). Spread out over a large area they contain several cities within commuting distance and at least one airport linking the area with the rest of the world (Hoyler et al, 2008). According to Coward & Salingaros (2004), most cities have a central region characterized by a peak in occupancy and traffic density. However, larger cities can also be polycentric. These polycentric structured regions often suffer from congestions, due to the criss-cross commuting patterns (Hoyler et al, 2008). Although polycentric urban regions have a potential competitive advantage over monocentric regions, they also face a major challenge in terms of social and spatial
context and increasingly also in terms of sustainability (Hoyler, 2008). The municipality is often the planner and operator and other times the local council has delegated the main part of these tasks to private or semi-private companies (Nielsen, 1999).

3.3.2 The importance of flows

Modern cities can be defined as socio-technical structures supporting flows of people, goods, services, information, capital, waste, water and meaning (Graham, 2001). Amin & Thrift (2002) maintain that cities are relay stations in a global world of flows and that modern economies are structured around the flows moving within and across national borders.

The flows in a city are just as important for the survival of the city as the blood supply is for the human body. Going back in history, many cities such as Constantinople (Istanbul) and Alexandria have lost some of their importance due to a decrease of flows in and through the city. Attracting flows to the city is of high importance and cities today are competing against each other to attract transactions (Kotler et al, 1993). Scott (2007) and Joye (2001) mean that the globalization trend brings cities all over the world into a new configuration of competition and collaboration. Researchers often rank the importance of a city through the degree of flows in and through the city. The research institute, Globalization of World Cities, sees the world as a city-centered world of flows and not as a state centered world of boundaries (lboro.ac.uk).

Globalization has lead to an increasing flow of goods, services, capital, people and information as well as the prosperity and growth of cities (Townsend, 2001). There is a connection between place and flows, with the flows having a huge impact on the place it runs through (Hesse, 2010). Kelly & Miller (1994) maintain that flows of people, commodities, information and energy require a complex network of interlinkages between the original city and the destinations. Amin & Thrift (2002) conclude that flows are more and more assumed into the system, with complicated schemes in place to secure the rapid transfer of people, goods, money and information around the world. The European Union, working as one single market, has implemented laws to ensure free movement of goods, people, capital and services between the member states (europa.eu). The European Union’s definition of the inner market has been adopted by several scholars (Meijers, 2005). In this thesis, flows will be defined according to the definition of the European Union and hubs are considered as important connections points for these flows and are thereby extremely important.
3.3.3 The characteristics of hubs

As O’Kelly & Miller (1994) put it, there are a confusing amount of definitions and ideas of what actually constitutes as a hub. Alumar & Kara (2008) define hubs as certain facilities serving as switching, transshipment and sorting points in many-to-many distribution systems. Roso et al (2009) define hubs as transshipment nodes with a central role in a network. Hesse (2010) suggests that hubs are intermediate places thanks to a strategic location with respect to market areas and that this strategic location, both concerning space and time, is the most important characteristics of these areas.

The connectivity concept is apparent, with hub facilities concentrating flows in order to take advantage of economies of scale. Flows from the same origin with different destinations are merged and combined with flows that have different origins but the same destination. O’Kelly & Miller (1994, p. 31) state that hubs “allow for the construction of networks, where direct connections between all origin and destination pairs can be replaced with fewer indirect connections”. Alumar & Kara (2008) define the capacity of a hub as the amount of traffic able to pass through the hub and group hubs as those collecting flows (non-hub to hub) and those distributing flows (hub to non-hub). There are also non-hub to non-hub connections which O’Kelly & Miller (1994) define as inter-nodal connections.

O’Kelly & Miller (1994, p. 36) defines the difference between the hub network components of nodes and hubs. A node is a “point location from which flows can originate and into which flows which are destined to that location can enter.” A hub has the “characteristics of a service node in the sense that it can be both a flow origin and destination, but it also allows the transfer of through-flows or transshipment flows which are not destined for that location. All through-flow that enters a hub must also exit that hub” (O’Kelly & Miller, 1994, p. 36). Hesse (2010) defines hubs as being located in between other places.

The economic benefits of a hub network, among others, constitute of the reduced network construction costs, the centralized commodity handling and sorting, and the possibility of scale economies through consolidation of flows (O’Kelly & Miller, 1994). The ecological as well as social benefits of hub networks can, if constructed correctly, lead to reduced congestion (Roso et al, 2009). Hub networks can also benefit from improved operating costs, service provision and market position. Due to globalization and increasing flows, cities and regions are now aiming at positioning themselves as hubs (Hesse, 2010). The location of hubs is critical to the performance of many industries and economies are deeply associated with hub operations (Huston & Butler 1991).
The relation of hubs, nodes and feeder lines is illustrated in figure 4. Nodes do not function as switching points and do not handle the magnitude of flows that the hubs do. Instead, nodes are points of flow origins and destinations. Looking at the flow of people, an origin node can be the living area for a person, whereas the work place could be seen as the destination node. Stations, where a change of transport mode is necessary, in order to reach the final destination, becomes flow intensive hubs. Flows are transported to the hubs through the feeder lines.

3.3.4 The importance of hubs

A well developed infrastructure and communication system, such as international airports, increases the attractiveness of large metropolitan areas (Jakobsen & Onsager, 2005). This is also recognized by Eurocities (2007), who claims that flow intensive facilities are likely to be located around transport hubs, in order to generate and attract major flows. Urban agglomerations have many advantages and social benefits and the link between urbanization and accessibility is stronger than ever (Hesse, 2010). Eurocities (2007) claims that growth and job opportunities are dependent on successfully managed urban transport systems. Highly skilled labor forces and well developed infrastructure, such as international airports and information and communication technology, are likely to be found in mega city regions (Hoyler et al, 2008). Some infrastructures have a specific role in placing cities on the global map, especially airports, which are increasing the international accessibility (Joye, 2001).
Eurocities (2007) has recognized the growing problem of congestion of access roads to major cities and predicts that 60 major airports will be severely congested by 2020. There is a similar tendency concerning ports and Eurocities recognizes intermodal transport systems as a solution to the congestive problems. Large networks exist in order to supply cities with necessities. The transportations of the goods need different transportation modes. If the network would collapse, the big cities in the world would not have enough food for the inhabitants within a matter of days. The urban agglomeration of Mexico City, for instance, receives 50,000 trucks of food every day (Stetter, 2000). According to Eurocities (2008), transport demand is driven by action and policies in areas such as education, business, culture and environment.

The local labor market, with its commuting patterns, is sustained by its infrastructure networks that increase the region’s mobility and interconnection (Graham & Marvin, 2001). Freight and passenger transports often compete for the use of the same infrastructure, which frequently results in acute congestions and user frustration. Having an efficient transport sector is important for a region’s competitiveness. Daily interchange points in the public transportation system are important and if not working properly they could seriously handicap the attractiveness of public transportation (Eurocities, 2008).

Urban agglomerations have a positive influence on cities’ abilities to work as hubs for learning, creativity and innovation, where great amounts of information are created and circulated on a daily basis (Scott, 2001). One of the reasons of why people gathered and settled in cities in the first place, was in order to communicate with each other to a lower cost. Coward & Salingaros (2004) maintain that this is still one of the main purposes and driving forces behind some city businesses. A city with efficient communication and information exchange channels will be more efficient in creating successful businesses than a city without such channels. As a complex system, producing commercial wealth and culture, the city has a functional architecture that is founded on the exchange of information.

The ability of a city to concentrate people and workforce, ideas and interactions can be considered as derived from connectivity (Hesse, 2010). Head offices of large corporate businesses can be considered hubs with flows of knowledge going in and out as well as within regions. Large urban agglomerations have location advantages related to advance infrastructure as well as highly qualified workers and the presence of universities and research centers (Jakobsen & Onsager, 2005). According to Amin & Thrift (2002), urban agglomerations uphold international competitiveness. The authors emphasize the role of the city functioning as a new knowledge point for the urban
agglomeration. Through the density of educated and creative people living in cities, the city itself becomes a place for knowledge, offering a meeting point for intellectual people. Amin & Thrift (2002) perceive cities as places of sociability, helping to strengthen economic transactions. Cities thus work as lubrication for the transactions of economic flows. Furthermore, cities can be defined as an initiator of demand, possessing economic power of consumption and motion.
4. The case of the Oresund Region

“As the importance of national borders continues to decline in the new borderless Europe, the Oresund Region is an example of an international region that reflects the modern age: two countries complementing one another in a region without frontiers.”

oresundsregionen.org

4.1 Introduction

The Oresund Region consists of Scania in Sweden and the Danish islands of Zealand, Lolland, Falster, Møn and Bornholm. The area is considered the Nordic countries’ biggest and most densely populated urban region with 3.7 million inhabitants; 2.5 million people on the Danish side and 1.2 million on the Swedish side (STMØ, 2006). There are 1.9 million people living in Copenhagen and Malmö and by 2027 the population of the whole region is expected to increase by 350,000 inhabitants. The European Observation Network classifies the Copenhagen Region as a European engine and the Malmö Region as a strong metropolitan European growth area (IBU-Øresund, 2009c). The Oresund Region contributes to 26 percent of the countries’ relative GDP (Øresundsinstitutet, 2009b) and the GRP (Gross Regional Product) of the Oresund Region amounts to 1.2 billion SEK, which is bigger than the individual GRP of Hamburg, Berlin and Stockholm. Øresundsinstitutet (2008a) states that the more integrated the Oresund Region becomes, the clearer it is that the economic center of Scandinavia is situated here. The Oresund Region is also Scandinavia’s biggest logistic center and one of the seven largest in Northern Europe. Looking at revenue and employees, the Oresund Region is comparable to the logistics centers of Hamburg, London, Paris and Rotterdam (swedavia.se).

The Oresund Region is one of Europe’s most dynamic regions with the Oresund Bridge linking Sweden and Denmark (oresundsregionen.org). With a unique geographical location, the region functions as a gateway to the continent and the important markets of northern Germany and Poland (Region Skåne, 2008). Due to time restrictions and the fact that the authors of the thesis are not well familiar with neither the country of Denmark or the Danish language, the geographical definition of the Oresund Region was narrowed down to the cites of Copenhagen and Malmö as well as the western part of Scania. The southwestern area of Scania is polycentric rather than dominated by one big city. For instance, 60 percent of the jobs and living areas are to be found in Malmö and Lund (Malmö Stad, 2009). The Danish side of the Oresund Region is more monocentric (STMØ, 2006), with
Copenhagen considered the core area of Denmark, whereas Malmö/Lund and Helsingborg are the core areas of Scania. These four cities are the biggest population centers whereas the other cities in the region do not have more than 100,000 inhabitants each (STMØ, 2006). Scania has a high availability and serves as Sweden’s gateway to the continent and is shown to be flow-intensive in terms of people, goods, capital and services (Region Skåne, 2009).

Since the opening of the Oresund Bridge in year 2000, a net worth of 7,600 people have moved from Denmark to Malmö and in total almost 15,000 have moved to Scania. Approximately 20,000 people commute from Scania to Zealand every day and 7,500 of these are Danish citizens working in Denmark. The last ten years the commuting across the border has doubled and in 2008 as much as 44 percent of the bridge traffic consisted of commuters (Øresundsinstitutet, 2009b). Since the working age population of 16-64 years is estimated to increase with 11 percent on the Swedish side of the region, while remaining the same on the Danish side, the demographic structure will most likely lead to labor flows from Scania to Copenhagen (STMØ, 2006). The currency difference affects the Oresund Region in several ways, with the increase of commuters being one of them. Salaries are more favorable in Copenhagen and the housing market is more favorable in Scania, resulting in both Swedish and Danish people living in Scania while working in Copenhagen (Øresundsinstitutet, 2008a). The living expenses are in general more favorable in Sweden compared to Denmark. The currency rate also affects the price of goods and services. Back in the 1980’s, the Swedes went to Denmark for cheap shopping and now it’s the other way around (Øresundsinstitutet, 2009a).

The Oresund Region functions as a development engine for northern Europe (Vägverket, 2010). Through the Oresund connection Malmö is linked to the Copenhagen metropolis with its superior market (Malmö Stad, 2009). There are several important industrial clusters in the region, such as clothing, cosmetics, food, mobile phones, pharmaceutics and research (Øresundsinstitutet, 2008a). A majority of big international companies have their Scandinavian head-offices located in the Stockholm and Oresund Region. According to Øresundsinstitutet (2007b), only regions containing enough expertise, international contacts and transport connections are able to attract head office functions. One advantage of locating businesses in the Oresund Region is the supply of both Danish and Swedish capital and labor forces. Lately many companies are establishing head offices and other central activities in Malmö, transforming the city to a head office city. The closeness to Copenhagen Airport and the advantage of attracting both Swedish and Danish employees are contributing factors to these establishments (Øresundsinstitutet, 2007a). The communication between companies may be hampered when located in two different countries. Therefore, a key challenge is to develop positive synergies over the national borders and further magnify the importance of the region. The
increasing accessibility in western Scania and Copenhagen, with growing employment numbers, contributes to a positive development of the Oresund Region’s business environment (Region Skåne, 2008).

4.2 Hub categorization

Throughout the research process a need for some sort of hub division was recognized. Based on the flows of people, goods, capital and services, the hubs were divided into three categories; transport, economic and infrastructure hubs. This categorization has been the starting point of the analysis process, and important in order to answer the research questions. To facilitate the reading of this thesis, the empirical chapter will be presented according to these categories. The additional category of feeder lines was added due to their great importance and connection to the hubs. These divisions are first discussed in order to give the reader an understanding of the important hubs in the Oresund Region. The outcomes of the interviews are then discussed separately in order to emphasize the research questions and facilitate the analysis. More scope has been given to the transport hubs, since the hub concept is clearly defined within this sector, compared to economic and infrastructure hubs. The hub concept of the transport sector will function as a base for drawing parallels to the other categories throughout this study. This hub division will be further discussed in the analysis chapter.

Figure 5 - Hub categorization
4.3 Defining hubs empirically

In terms of logistics, a hub is a central point or area where different flows of goods or people are left off, reloaded, stored or simply passed through. A hub is a single actor and a prerequisite for the network it is a part of. They are connecting roads of transport and terminals into functioning transport networks. These hubs have the possibility of collaborating with each other to achieve unity. A hub is a fixed point limited in its geographical spread and a region can also be considered a hub. The Oresund Region can be compared to a logistic hub where different modes of transport and actors collaborate within and across a constrained area (STMØ, 2006). A hub is a central node where the transshipment takes place to another transportation mode in order to reach the final destination. The location of hubs depends on several characteristics. They should preferably be located close to big production and consumption areas as well as to apparent origin and destination points for one or several transportation modes. The hubs should be located in strategic areas where big flows run through and make it easy to redistribute flows to different destinations, by switching to other modes of transportation. By rationalizing the transport hubs a more efficient way of transporting goods can take place at the same time as economizing the limited resources (SOU, 2007). Hubs have functions that others depend on and they themselves are dependent on others. Some examples of functions that have a hub profile are transport and municipal utilities (MSB, 2009).

4.4 Transport hubs

The transport sector is a supplying sector and a disruption in the transport sector could have widespread impacts on other critical functions in society, such as primary municipal utilities, healthcare and food supply. The transport sector has internal dependency both between the different types of transportation modes as well as with the infrastructure. When transporting a good from a supplier to the final customer all kinds of transportation modes might be included. The drinking water supply is dependent on the transport sector in the sense that they need regular chemical deliveries for water purification. Emergency medical care, heating plants, fuel deliveries and food supply are other sectors reliant on the transport sector (MSB, 2009).

A functioning transport sector is crucial for the growth of a region (DI, 2010). There is a correlation between growth and transport volume; when cities grow so does the need for transportation, in means of both passengers and goods. The European Commission estimates that by the year of 2020 the World GDP will increase by 52 percent and transportations of goods will increase by 50 percent.
The road traffic dominates the transportation of goods in Europe. In the year of 2000, 43 percent of the goods were transported on the roads and the number is expected to have increased to 46 percent by the year of 2010. Transportation by railway has decreased its relative share. In 1970, the railway accounted for 30 percent of the transportation in Europe and today it is down to merely 10 percent. In global terms, shipping is the dominant transportation mode (SOU, 2007).

The logistic sector is crucial for the economy, not just in being a big and important sector but also in the way it influences others (DI, 2010). All sectors depend on the transportation system to get people and goods from origins to destinations. The logistical relationship with other sectors in the Oresund Region is complex and extensive. A disruption of the traffic flow has numerous effects on the surroundings. For instance a shut down in the transport system will not only lead to employees not being able to reach their jobs, it also means that the goods will not reach their destinations and waste will not be picked up. For a hospital the effects of a disruption could be dire (STMØ, 2006). A real life example took place in the UK in 2008, when the tank truck drivers went on a strike and the city’s fuel supply ran extremely low. The effects were evident in just a few days; food disappeared from the stores when no stocks were able to be refilled, due to trucks not being able to deliver goods to the stores. Most stores today use a just in time system and are very dependent on a continuous flow of goods (Nordlog Conference, 2010).

Flows can be divided into those moving in and out of the region and those moving through the region, so called transit (STMØ, 2006). The Oresund Region has a favorable geographical location for logistics in Scandinavia and the Baltic Sea area. Transportation is international by nature (DI, 2010) and the Oresund Region is an important hub for the flows between Scandinavia and the central parts of Europe. All four transport modes; road, railway, shipping and aviation; are represented in the area and compared to the rest of Europe the allocation between these are considerable auspicious. The Oresund Region has the best multimodal accessibility of the Nordic Countries (IBU, 2009) and these conditions have made the Oresund Region quite attractive for the establishment of logistic companies (STMØ, 2006).

The Oresund Region contains many important hubs and the availability of these is an important parameter in relation to the quality of the hubs and thereby also for the competiveness of the region. One way of defining important hubs is by looking at the flow volume or the hubs’ centrality or accessibility to and from the region. Passenger hubs cover airports, ports and train stations and the most important ones in the Oresund Region are the airports of Copenhagen and Malmö; the ports of Copenhagen, Helsingborg, Malmö, Trelleborg and Ystad; and the train stations Nørreport, Kastrup.
Station, and the central stations of Copenhagen, Helsingborg, Malmö and Lund (IBU-Øresund, 2009b).

The modes of transport; road, railway, sea and air; have different qualities and network characteristics when it comes to appropriability and competitive advantage. Railway and sea transport have similar qualities in terms of handling the same kinds of goods, namely those of big scale, long distance and low value as well as low demand of time, frequency and service. They are competitors and that is most likely one reason for the lack of collaboration (STMØ, 2006). They also compete for the infrastructure, for instance on railway tracks where trains of goods need to coexist with trains of passengers. This conflict is also apparent on the road net as well as in shipping (SOU, 2007). Road and air freight on the other side handle small scale shipments and can satisfy a high demand of service.

A majority of transportation is handled by specific shipment and forwarding companies. These are considered intermediaries depending on knowledge and contacts. They account for the coordination of goods by gathering small streams from different origins into bigger flows with the same destinations. Transport hubs are the collection and distribution points of these streams and increase the efficiency, making it possible to use large-scale transportation modes (STMØ, 2006). In terms of intermodal transportation, where different transportation modes collaborate, ports and combi-terminals are considered to have the biggest importance. For Sweden, where goods are produced and consumed over great distances, intermodality is more common compared to Denmark. Due to the increase of shipping, intermodal transportation is becoming more common in the Swedish ports with most of them already considered as intermodal hubs for import as well as export. Furthermore, several of them pursue extensive combi-terminal activities in the port areas (SOU, 2007).

Overall the Oresund Region received and sent about 86 million tons of cargo to and from the surrounding regions in 2008. Furthermore, 140 million tons of cargo was transported within the region and transit goods amounted to 25 million tons of cargo. Road transport is the predominant mode of transportation in the region, with 58 percent of the goods transported to and from the region by trucks. When transporting goods between the Oresund Region and the continent, carriage by sea is the dominant transportation mode (IBU-Øresund, 2009c). It has been estimated that 15 percent of the GRP (Gross Regional Product) in the Oresund Region is related to logistics, such as transportation, storage and packaging. Scania has an important role in Sweden's foreign trade, with massive flows of freight passing through the region (Region Skåne, 2008).
4.4.1 Airports

Of the total air transportation in the world, approximately 70 percent consist of passenger transport, 28 percent of air cargo and 2 percent of postal transport. In terms of weight only two percent of all global export and import freight are transported by air. However, when considering the value of transported goods, this figure is as high as 30 percent. High valued goods such as machine components, electronics and pharmaceuticals depend on a speedy and secure deliverance. Air freight consists of 20-25 percent of Sweden’s export value (SOU, 2007).

The airports that dominate the passenger traffic today are also important air freight hubs (SOU, 2007). The two most important airports in the Oresund Region are Copenhagen Airport (Kastrup) and Malmö Airport (Sturup). Copenhagen Airport is served by more than 60 airlines flying to more than 120 different destinations. During 2008 the airport had about 264,000 take-offs and landings, so-called movements, and 21.5 million passengers. Copenhagen Airport functions as a hub for SAS, flying almost half of their passengers. About 30 percent of all passengers from Copenhagen Airport are Swedes, making Kastrup “Sweden's” second largest airport (Region Skåne, 2008). About 28 percent of the departing passengers were transfer or transit passengers (Region Skåne, 2008). Copenhagen Airport is well connected to the public transportation system with a train and metro station of its own. There are also buses going to and from the airport. About 54 percent of the passengers travel to the airport with public transportation, compared to the European average of only 32 percent (IBU-Øresund, 2009b). The supply of airline routes is important for the inhabitants in the Oresund Region, but also for the business environment located there. Developing a range of air routes with convenient and fast connections is an important component in order to attract more visitors to the region (Region Skåne, 2008).

Copenhagen Airport is also an important hub for the transportation of goods and in 2008 there were 347,200 tons of goods being transported from the airport. The amount of goods from Copenhagen Airport has nearly doubled during 1990-2000. However, from 2000-2008 the quantity of goods transported fell by 20 percent. Copenhagen Airport is central for many courier companies such as DHL and Fedex that have chosen to establish central hubs at the airport. DHL chose to establish themselves at Copenhagen Airport due to the central placement between Scandinavia and the rest of Europe and because of the well developed infrastructure around the airport (IBU-Øresund, 2009b).

Malmö Airport is served by 20 airlines with 34 different destinations, of which 30 international. However, out of 1.9 million passengers in 2007, 1.15 million were domestic flights. During 2008, Malmö Airport had 28,000 movements. The accessibility with public transport is poor and the only
connection is by private buses. With 1,500 employees within the airport area, as well as passengers, there is a need for more transport connections (IBU-Øresund, 2009b). The international flights are expected to increase in the region, whereas the domestic flights in Sweden are expected to decrease, since the train has become an alternative for many domestic trips (Region Skåne, 2008). In 2007 there were 43,300 tons of goods transported from Malmö Airport (IBU-Øresund, 2009b). The vision is to turn Malmö Airport into the Oresund Region’s obvious choice for air cargo. As a consequence of the Oresund Bridge, several logistic companies have moved their operations to Malmö Airport. The catching area of Malmö Airport covers most of southern Sweden and thereby 40 percent of the Swedish population. The Oresund Bridge has contributed to expanding this catching area to Denmark as well (swedavia.com).

4.4.2 Combi terminals

Combi terminals are multi-modal in the sense that they use several modes of transportation. Combi terminals serve as transshipment points, where goods shift from one transportation mode to another. The combi terminals in Helsingborg, Malmö and Høje Taastrup are considered as the most important combi terminals for the transportation of cargo in the region. Measured in TEU (Twenty-foot Equivalent Unit), Malmö is the biggest combi terminal in the Oresund Region followed by Høje Taastrup, Helsingborg and Trelleborg (see table 1). Combi terminals are much more common in Sweden than in Denmark. The multimodal transportation between Malmö and Stockholm is today so effective that it can compete with trucks on time. One of the reasons for the success of the multimodal transportation between Malmö and Stockholm is the direct accessibility to the main line. All railway traffic in Malmö has to go through Malmö Central Station and with a projected growth of both cargo and passengers traffic it can create a long-term capacity problem around Malmö Central Station (IBU-Øresund, 2009b).

<table>
<thead>
<tr>
<th>COMBI TERMINALS</th>
<th>TEU, 2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malmö</td>
<td>112,000</td>
</tr>
<tr>
<td>Høje Taastrup</td>
<td>91,800</td>
</tr>
<tr>
<td>Helsingborg</td>
<td>65,000</td>
</tr>
<tr>
<td>Trelleborg</td>
<td>56,000</td>
</tr>
</tbody>
</table>

Table 1 - Flow statistics of the combi terminals in the Oresund Region (IBU-Øresund, 2009b)
A study conducted by IBU-Øresund shows that forwarder agents’ use of the railway differs between the countries. In Sweden railway is competitive against other modes of transportation, whereas the opposite is true in Denmark. Key parameters for railway competitiveness are the economy, flexibility and reliability. If combi traffic is to become a competitive transportation mode in Denmark, improvements are needed in all three key parameters. Cargo going from Sweden to Denmark and Germany is reloaded on trucks since railway is not a competitive mode of transportation in neither of the countries. Another important factor to consider is that Denmark, compared to Sweden, is a small country with short distances and that it is not always time and cost effective to make transshipments. Therefore the efficiency at the combi terminals must be high in order for them to be competitive in comparison to the truck traffic. These factors have led to combi terminals being less important in Denmark compared to Sweden (IBU-Øresund, 2009b).

4.4.3 Ports

Shipping has increased in recent years, especially international ferries (Region Skåne, 2008). Helsingborg, Copenhagen-Malmö, Trelleborg and Ystad are considered as some of the main ports for cargo transportation in the Oresund Region (IBU-Øresund, 2009b). Bigger European ports such as Rotterdam and Hamburg serve as feeder hubs to the smaller ports of Copenhagen, Malmö and Helsingborg (SOU, 2007). Looking at passenger volumes from 2007 (see table 2), the biggest ports in the Oresund Region are those in Helsingborg, Ystad, Trelleborg, Copenhagen and Malmö (IBU-Øresund, 2009b). The ports in Scania are big in a Swedish context, but rather small in an international perspective. They have strong links to the ports and transportation systems on the other side of the Baltic Sea and to the global port hubs of Hamburg, Rotterdam and Bremerhafen (Region Skåne, 2008).

<table>
<thead>
<tr>
<th>PORT</th>
<th>PASSENGERS, 2007</th>
<th>CARS, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helsingborg</td>
<td>11,000,000</td>
<td>2,000,000</td>
</tr>
<tr>
<td>Ystad</td>
<td>1,900,000</td>
<td>425,000</td>
</tr>
<tr>
<td>Trelleborg</td>
<td>1,800,000</td>
<td>335,000</td>
</tr>
<tr>
<td>Copenhagen</td>
<td>850,000</td>
<td>65,000</td>
</tr>
<tr>
<td>Malmö</td>
<td>175,000</td>
<td>5,000</td>
</tr>
</tbody>
</table>

Table 2 - Flow statistics of the ports in the Oresund Region (IBU-Øresund, 2009b)
The ports in the Oresund Region have become specialized in handling different kinds of goods, such as container, bulk\(^6\) and ro-ro\(^7\). The ports of Malmö and Copenhagen are merged into one border-crossing company, Copenhagen Malmö Port (CMP). Malmö Port has a higher turnover on freight compared to the port in Copenhagen (IBU-Øresund, 2009b) and a strategic national importance, connected to Germany (SOU, 2007).

The three container ports of Copenhagen, Helsingborg and Malmö primarily have a connection to the intercontinental container ports in Hamburg, Rotterdam and Antwerp. However, the Copenhagen port suffers from accessibility issues, since it is not connected directly to the main road network. In Denmark there is a political discussion regarding shipping as an alternative to road transportation, in order to reduce congestion on the roads as well as reducing environmental impacts. An agreement to improve the accessibility to the ports in Helsingör and Copenhagen has recently been reached (IBU-Øresund, 2009b). In order to reduce congestion in the ports, port shuttles on railway are used to distribute flows as fast as possible. Helsingborg and Trelleborg have extensive port shuttle traffic (SOU, 2007).

Due to increased globalization, CMP has become a successful hub for car transshipment. Toyota has their European central automobile warehouse located in Malmö Port (STMØ, 2006). The Danish part of CMP serves as Northern Europe’s center for cruise ships, whereas the Swedish part of CMP, among other things, is an international hub for transit oil (CMP, 2009).

### 4.4.4 Train stations

The average use of railway for transportation of goods is higher in Sweden than in the European Union and lower in Denmark (SOU, 2007). There are several reasons to why Denmark has such a low railway use percentage. Since Denmark is a geographical small country it is more efficient to use trucks, whereas in Sweden there are long distances to cover, making the railway not only more environmentally friendly, but also economically competitive (STMØ, 2006).

When the transportation distance of goods exceeds 650 kilometers, the railway is normally considered the most cost efficient alternative (STMØ, 2006). However, it is also extremely sensitive to bureaucratic barriers and lack of collaboration between national railway operators (SOU, 2007). When considering all the stops and repackaging of goods and change of locomotives the average

---

\(^6\) Bulk is divided into dry bulk, forest products, coal, steel products; and liquid bulk, oil, ethanol (SOU 2007).

\(^7\) Roll on-Roll off vessels are designed so that the cargo easily can be loaded on and off (SOU, 2007).
speed for international transport of goods on railway is 18 kilometers per hour, which is lower than an ice-breaker in the Baltic Sea (STMØ, 2006). In the US, with no national barriers, the railway has been able to maintain a market share of 50 percent (SOU, 2007).

The railway capacity depends on several factors, such as the number of tracks and the speed limit (IBU-Øresund, 2009b). Other obstructions, which perhaps are not quite as obvious, include the different regulations such as which side to drive on. Whereas Denmark has right-hand traffic; Sweden still has left-hand traffic, making it problematic to cross the border (STMØ, 2006). The possibility of passing another train or crossing the track also plays an important role, especially on the single direction stretches. A lot of these single-track stretches cause bottlenecks for the railway traffic. Between Kastrup-Malmö it is not the Oresund Bridge itself that limits the traffic, but the access tracks to and from the bridge. Scania are experiencing capacity problems mainly on the stretches between Helsingborg-Ångelholm, Helsingborg-Åstorp and Malmö-Höör (IBU-Øresund, 2009b).

In the long term, the southern mainline between Malmö and Stockholm will get four tracks through Scania but since bottlenecks are also situated further north in the system, a development merely in Scania will not solve the problem. On the stretch between Malmö-Trelleborg there is a need to expand the capacity through more track crossing opportunities. Today, besides a daily night train, there are no passenger trains going between these cities (IBU-Øresund, 2009b).

The most important train stations in the Oresund Region, according to daily passenger volumes of 2007, are Nørreport, Copenhagen Airport, Høje Taastrup and the central stations of Copenhagen, Malmö, Lund and Helsingborg, illustrated in table 3. In 2005, approximately 30 cargo trains a day crossed the Oresund channel. In 2015 it is estimated that the figure will have risen to 50-65 cargo trains a day (IBU-Øresund, 2009c). To get a rational management of freight the railway carriers are connected to each other into whole trains and these so called classification yards function as hubs for the flow of goods. The classification yard in Malmö and Helsingborg handle the main cargo train traffic, where the trains are collected for further transportation into Europe and Sweden. The classification yards in Malmö and Helsingborg have a capacity of 3-4 trains per hour. On the Danish side, the classification yard in Høje Taastrup is the only one in the area. The facilities in the Copenhagen port could be used to handle cargo, but are not used for these purposes today (IBU-Øresund, 2009b).
### Table 3 - Flow statistics of the train stations in the Oresund Region (IBU-Øresund, 2009c)

<table>
<thead>
<tr>
<th>Train Stations</th>
<th>Daily Passengers, 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nørreport</td>
<td>106,000</td>
</tr>
<tr>
<td>Copenhagen Central Station</td>
<td>93,000</td>
</tr>
<tr>
<td>Malmö Central Station</td>
<td>47,000</td>
</tr>
<tr>
<td>Lund Central Station</td>
<td>28,000</td>
</tr>
<tr>
<td>Copenhagen Airport Kastrup</td>
<td>19,000</td>
</tr>
<tr>
<td>Høje Taastrup</td>
<td>19,000</td>
</tr>
<tr>
<td>Helsingborg Central Station</td>
<td>17,000</td>
</tr>
</tbody>
</table>

### Economic hubs

Considering the financial sector, all functions depend on transactions. This function is a hub in the financial system and must work in order for all other functions to be able to run. In society people and companies need to be able to pay wages, receive payments for goods and services and be able to pay through card payments. Most functions in society are not affected by minor disruptions of the financial service. However, in case of longer disruptions food and fuel service may face large problems and may be forced to close down for a while. Closing food and petrol services will have an impact on other functions in society and thus a more long lasting disruption in the financial system could have more extensive consequences (MSB, 2009).

Even though capital flows play an important part in society, the concept of economic hubs does not seem to exist. Due to the fact that the hub concept clearly exists within the transport sector, and to some extent also among several infrastructure systems, the concept of hubs was transferred from the transport sector and applied on economic and infrastructure hubs.

### Infrastructure hubs

The technical development of the past century has had a tremendous impact on society. The electronic communication has become an important function and it has enhanced the efficiency in handling different flows. However, this change has also led to a decrease in the dependency of functions being handled by people. From an economic point of view this is normally considered...
positive, but in the event of a crisis, there might not be any supporting methods for the work that computers, telephones and other signaling systems are handling today. In case of a disruption in the electronic communication system, most other functions would be affected. The financial system, transportation, food and electricity supply would immediately be affected by a disruption. Furthermore, people would not be able to communicate with their surroundings and not be able to gather information. Internationalization has led to many functions not even being located in Sweden, making it even more important to uphold electronic cross-border communication. In case of a disruption in the telecommunication, municipal utilities can only endure such a disruption to a certain degree. Furthermore, an extended disturbance with waste and water management will become intricate and thus also affect other functions in society such as healthcare and food production. Personnel shortage in municipal utilities can have a great effect on small municipal utilities, whereas large facilities usually can handle a personnel shortage better. Labor intensive functions such as waste management can be hit harder if people are not able to get to their jobs (MSB, 2009).

Due to society’s dependency on energy, a disruption in the electricity supply would affect all critical functions in society. Vital functions such as cash supply, food supply, transportation, fuel supply and primary care are all dependent on electricity. Some functions have auxiliary power solutions. However, these have a limited duration and can be affected by an extended power outage. An extended power outage will also have an effect on private people in the sense that people will for instance not be able to cook food or operate their computers (MSB, 2009).

4.7 Feeder lines

Although not being actual hubs, feeder lines were identified as important elements when investigating the Oresund Region. With hubs being the connection points in the network, feeder lines are the routes in between, feeding the different hubs with flows. Identified feeder lines in the Oresund Region are bridges, railways, roads, electric and communication grids.

With road traffic dominating the transportation of goods in the world, feeder lines such as roads have an important role (SOU, 2007). From a cost point of view, trucks are more suitable within distances of 200 kilometers (STMØ, 2006). According to IBU-Øresund (2009b), the most important roads leading to and through the Oresund Region are the E-numbered roads. The biggest flows of goods on the Swedish side of the Oresund Region moves on the four national roads in Scania, E4,
E22, E6 and E65. The E6 route north of Helsingborg is the one most congested (STMØ, 2006). In general, one can also say that the routes in the Copenhagen and Malmö areas are heavily congested. Køgebugt motorway in Denmark is the most passenger intensive route, with 50 million people transported in 2006 (IBU-Øresund, 2009c). There is a lot of transit traffic going through Scania putting strains on the roads. The large volumes of cargo through Scania are transported south via Helsingborg, the Oresund Bridge, Trelleborg and Ystad and the biggest amount goes through Trelleborg (IBU-Øresund, 2009b). Only 10 percent of the transports from Sweden to the continent go through Denmark and those are almost always those where time is an important factor (SOU, 2007).

4.8 Collaboration in the Oresund Region

There are great barriers in achieving an efficient Oresund Region. The structure barriers originate from the lack of coordination between the public authorities. Sweden and Denmark have different laws and regulations concerning for instance taxes, unemployment and maternity leave. There are also other kinds of rules creating barriers for the mobility between the countries. For instance, the maximum allowed length of trucks in Sweden is 25.5 meters, whereas in Denmark it is only 18.5. This means that some trucks from Sweden are not able to pass through Denmark on their way to Europe. Barriers might be expensive, delaying, magnifying problems and through that decrease the competitive advantage in businesses as well as decrease the efficiency in the public sector, eventually affecting the attractiveness of the region (STMØ, 2006). There is an ambition to increase the railway transportation share because of its environmental advantages and numerous efforts to deregulate rail transport and reduce administrative barriers to cross-border transport are planned. The European Union has presented three proposals to improve and overcome the different barriers that restrict the railway traffic today (SOU, 2007).

A more apparent tendency is that logistic companies are hired instead of hiring the transporter directly. This leads to a more developed collaboration between the forwarding companies and the transporters. They are becoming more and more integrated, for instance with more developed technology (SOU, 2007).

The different levels of collaborations in society could be seen as taking place on a strategic, tactical and operative level and they are all needed for society to function. The strategic level has a long-term perspective, with the planning of big areas such as infrastructure investments, public regulations, education and different technological systems. It is more likely to take place on a country level. The
tactical level has a medium long-term perspective (3-4 years) and is characterized by collaboration aspirations between municipalities on a regional/city level. The operative level has a short-term view (1 year) and is characterized by low collaborations between the networks. The utilizations of existing networks are important for a prosperous development and the different sets of regulations may prevent the utilizing of each other’s networks (STMØ, 2006).

4.9 Mapping the hubs

Mapping the hubs was an important step in defining which hubs are to be considered more important than others in the Oresund Region. By first identifying important hubs, the categorization model was able to be constructed. Several hubs were then added to the list through interviews with key people within the field of study. A list of the hub types, with the number of mapped hubs in the Oresund Region, is presented in table 5. The physical locations of the hubs are illustrated in figure 6.

<table>
<thead>
<tr>
<th>HUB CATEGORY</th>
<th>SYMBOL</th>
<th>HUB TYPE</th>
<th>MAPPED HUBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Hub</td>
<td></td>
<td>Airport</td>
<td>3</td>
</tr>
<tr>
<td>Transport Hub</td>
<td></td>
<td>Combi Terminal</td>
<td>4</td>
</tr>
<tr>
<td>Transport Hub</td>
<td></td>
<td>Port</td>
<td>5</td>
</tr>
<tr>
<td>Transport Hub</td>
<td></td>
<td>Train station</td>
<td>8</td>
</tr>
<tr>
<td>Economic Hub</td>
<td></td>
<td>Attraction Center</td>
<td>4</td>
</tr>
<tr>
<td>Economic Hub</td>
<td></td>
<td>Financial Center</td>
<td>2</td>
</tr>
<tr>
<td>Economic Hub</td>
<td></td>
<td>Shopping Center</td>
<td>14</td>
</tr>
<tr>
<td>Economic Hub</td>
<td></td>
<td>Warehouse</td>
<td>4</td>
</tr>
<tr>
<td>Infrastructure Hub</td>
<td></td>
<td>Communication</td>
<td>3</td>
</tr>
<tr>
<td>Infrastructure Hub</td>
<td></td>
<td>Energy Plant</td>
<td>5</td>
</tr>
<tr>
<td>Infrastructure Hub</td>
<td></td>
<td>Research Center</td>
<td>4</td>
</tr>
<tr>
<td>Infrastructure Hub</td>
<td></td>
<td>Waste Center</td>
<td>6</td>
</tr>
<tr>
<td>Infrastructure Hub</td>
<td></td>
<td>Water Works</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 4 - Overview of the mapped hubs in the Oresund Region
Figure 6 - Hub map of the Oresund Region

4.10 Outcomes of the interviews

The following people were interviewed concerning hubs in the Oresund Region, dependencies, networks and collaboration as well as urbanization effects.

<table>
<thead>
<tr>
<th>NAME</th>
<th>COMPANY POSITION</th>
<th>EMPLOYER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Henrik Bjoerner Soee</td>
<td>Shopping Center Manager</td>
<td>Fisketorvet</td>
</tr>
<tr>
<td></td>
<td>Shopping Manager and Director of Marketing</td>
<td>Kastrup Airport</td>
</tr>
<tr>
<td>Lars-Anders Fridström</td>
<td>Local Manager</td>
<td>Sydvatten</td>
</tr>
<tr>
<td>Ola Gunnefur</td>
<td>Property Manager</td>
<td>Jernhusen</td>
</tr>
<tr>
<td>Gudmundur Kristjansson</td>
<td>Assistant Business Manager</td>
<td>Näringsliv Skåne</td>
</tr>
<tr>
<td>Carl-Johan Lange</td>
<td>IP Core Net Planner</td>
<td>TeliaSonera</td>
</tr>
<tr>
<td>Christian Lindell</td>
<td>Analysis Manager</td>
<td>Näringsliv Skåne</td>
</tr>
<tr>
<td>Anders Olshov</td>
<td>CEO</td>
<td>Øresundsinstitutet</td>
</tr>
</tbody>
</table>
Hubs are clearly defined within the transport and logistics sector. Kristjansson and Lindell at Näringsliv Skåne define hubs as switching points and claim that the concept is not considered as much outside the transport sector. For instance, the interviewees at Vombverket and Handelsbanken had no knowledge about the concept when starting the interviews. Noack at DI Transport defines hubs as national and international connection points. Pettersson at CMP maintains that the hub concept is often used within the shipping business. However, CMP does not consider itself as a hub, even though many of their customers do. Pettersson points out that many of their customers have hub operations established at CMP. Toyota, for instance, have their Northern hub for car distribution in Malmö Port, a port that also functions as a hub for Russian oil. A hub could, in that sense, be defined as a concentrated distribution center. According to Bjoerner Soee at Fisketorvet, people are only at a hub because they are on their way to somewhere else. Gunnefur at Jernhusen defines hubs as meeting points for people and goods and as switching points for different traffic modes.

The concept of an economic hub, however, does not seem to exist. Persson at Handelsbanken in Malmö maintains that the term hub is not used within the banking sector, but defines an economic hub as a market place or a meeting point, with banks as giant hubs and bank offices as mini hubs. Banks are the hubs of all transactions.

4.10.2 Vital hubs in and for the Oresund Region

The majority of the interviewees stressed the importance of Copenhagen Airport. Kristjansson and Lindell maintain that Copenhagen Airport puts the region on the global map and improves the appeal and availability of the Oresund Region. It is considered a region airport, not a Danish one, and for the
Swedish travelers there is not a feeling of going abroad. If SAS closes down its operation it could cause problems for Copenhagen Airport. They face the risk of being transformed into a feeder airport. Noack and Winther claim that the airport is an international connection point for people and agrees that if SAS closes down, Copenhagen Airport could lose its importance in the region. Bjoerner Soee says that the importance of Copenhagen Airport as a hub has decreased the last five years and the airport is not as important today as it was five years ago. With SAS risking bankruptcy Copenhagen Airport would lose 20-30 percent of the passengers and also its status as Scandinavia’s most important airport hub. Winther further points out that the airport is of high importance for the multinational companies in the region. Pettersson considers Copenhagen Airport an important hub for his own business in the sense that many international cruise ship passengers arrive at Copenhagen Airport before bordering their ships. Copenhagen Airport is therefore fundamental for CMP’s cruise ship business and CMP consider the airport as a compliment and a partner to the ports of Malmö and Copenhagen.

Pettersson also points out the port’s importance for the growth of the Oresund Region. Several industries are completely dependent on the port and for instance all oil distributed to Zealand and Scania goes through CMP. The ports in the Oresund Region are important hubs for the flows of goods and people. Whereas big storage and distribution facilities for cars, oil and stainless steel are located in the Malmö Port, Copenhagen Port is Northern Europe’s biggest port for cruise ships. CMP wants to attract big flows and customers with a hub way of thinking, because those are the long-term and stable customers. Petterson states that 90 percent of all goods go through the ports and that 25-30 percent of all goods to Sweden goes through Scania, making the port in Malmö very important. Out of 150 million tons transported in and out of Sweden, 11-12 million tons go through Malmö Port. Due to CMP’s importance for the inter-European flows, they recently received 60 million SEK in grants from the EU.

According to Winther, accessibility is the most important factor for the growth of a region and vital for the growth of the local labor market and businesses. A good transportation system increases that accessibility. A closeness to and availability of the public transportation system, such as train stations and busses, is important. Sturesson maintains that the airports and the ports are of major importance for the Oresund Region, by making it more accessible and increasing the attractiveness.

Gunnefur at Jernhusen points out the importance of the train stations for the Oresund Region. Travelling by trains is estimated to double within ten years, mostly because of the commuters within the region. The central stations of Malmö, Lund and Copenhagen are important hubs due to the
commuting traffic. For instance, 85 percent of all traffic between Lund and Malmö consists of commuters. Kristjansson and Lindell also acknowledge the importance of train stations. They perceive Malmö Central Station as an important train hub with the surrounding bus traffic functioning as feeder traffic. When the City Tunnel stations are finished they will probably become the most important hubs in Malmö. In Denmark, Noack mentions Nørreport Station in Copenhagen as the most important railway hub. Because of its closeness to the city shopping and its metro connection, it has the most passengers a day of all the train stations, even more than Copenhagen Central Station. Kastrup Station at Copenhagen Airport is also important since it connects the metro with the airport and since it is the closest station before the Oresund Bridge.

The importance of public transportation is also acknowledged by Bjoerner Soee and Sturesson. Their hubs are dependent on trains and busses in getting their employees and customers to the shopping centers. Fisketorvet, for instance, is located close to the central station in Copenhagen and many of their customers use the metro to get there. Still, many customers go there by car and thus the roads are important feeder lines for the shopping centers.

When it comes to important economic hubs, Rasmussen at Handelsbanken in Copenhagen views banks as an important function in today’s society. Without a functioning banking system payments and investments would be hindered. Persson at Handelsbanken in Malmö agrees with this and claims that banks are the lubrication of the system. Banks are a requirement in order for society to have the development of today. Loans are needed for investments and banks with their mediation of money are a prerequisite for society’s operations. However, banks are also dependent on a functioning city with everything that society needs. There has to be a mobility and availability in the region. A well functioning transport system is needed in order for workforce and customers to reach the bank offices. A well developed broadband infrastructure is necessary in order for clients to do their own banking online. Electricity and heat is needed on the premises. Attractive cities with a strong business life are basic and a flow of people is necessary for the establishment of banks. When the Oresund Bridge was built business in the region grew.

Winther maintains that the metropolitan area contains huge economic activities and that Copenhagen in itself is a very important hub for Denmark. With twelve percent of the total employment in Denmark located in Copenhagen, the city center functions as an economic hub due to the high concentration of labor. Other important economic hubs in the Copenhagen area are according to Rasmussen the PBS center, VP, and the Central Bank of Denmark. These three hubs are dependent on trains and busses in getting their employees and customers to the shopping centers.

\[8\] Transaction system, owned by major banks in Denmark
institutions are all involved in the transfer of money. Furthermore the money depots of Loomis and Danske Bank could be considered economic warehouses of money.

Lange at TeliaSonera maintains that the core communication stations in Malmö, Lund and Copenhagen function as central regional stations collecting the telecommunication traffic in the area. Furthermore, Lange emphasizes the importance of the stations working as hubs for the communication between Sweden and Denmark, as well as between Sweden and North America. When an IP connection is made from Sweden to the USA, the call first passes either the station in Malmö or Lund. Thereafter, the call is distributed to Copenhagen before it is passed across the Atlantic to the US. In case of malfunction in these hubs, the communication traffic could be switched and go via Stockholm to Hamburg and then to the US.

Even though feeder lines such as bridges are not considered hubs, the importance of the Oresund Bridge was mentioned in many of the interviews. According to Kristjansson and Lindell, the bridge has contributed to a more integrated area and has facilitated the commuting between Sweden and Denmark. With lower housing prices and living expenses in Malmö, and significantly higher wages in Copenhagen, as well as the currency difference, living in Malmö and working in Copenhagen is a well-used practice. Today there are approximately 20,000-25,000 commuters across the border and the bridge has been a big contributing factor. Although before 2007 it was the job market that impelled the integration it is now the housing market. Because of the monetary gain from the currency difference a lot of Danish people also go to Sweden to shop and the bridge abutment has become an attractive settlement for the Danes. Winther also points out highways as important feeder lines. For the local companies and the local labor market, the highways are of importance in order to get to workplaces and customers. Fridström at Sydvatten states that for his business, feeder lines such as roads are very important, especially those roads to where the chemical transportation is restricted. The Oresund Region is an important transit region with a lot of truck traffic. According to Petterson, feeder lines such as roads and railways are important in order to move the goods out of the ports, and in that way CMP functions as an intermodal hub with switching points of transport mode.

4.10.3 Dependencies

Although Copenhagen Airport is one of the most important hubs in the region, Bjoerner Soee highlights the fact that the airport is nothing in itself without the other hubs. Airports are dependent
on other transportation infrastructures such as roads and railway in order for the flows of passengers and goods to reach the airport. Airports also depend on other infrastructure flows such as communication and electricity. Electricity is crucial in order to be able to operate the airport. With an extensive amount of transactions taking place at airports, there is also a dependency between the airport and the business life. Bjoerner Soee states that the airport is nothing without the airlines and the other way around.

A well developed infrastructure is seen as important by the majority of the interviewees. Sturesson claims that the shopping centers are totally dependent on electricity in order to operate, since without electricity there is no possibility of receiving payments from the customers. Persson says that when there is a power outage in the office, there is a risk of loss of income. Banks are dependent on computers and therefore electricity is extremely important. In case of a system malfunction, the banks run a risk of lawsuits if customers for instance are unable to invest their money on the stock exchange that specific day. Communication is another important factor and it is essential that people within the company are able to contact each other. The transportation system also depends on electricity. Gunnefur states that if something would happen to the energy plants distributing power to the railway system, the trains would not be able to run and thus the businesses located at the central stations would be affected.

Lange states that the communication system is extremely important for today’s society. Without a functioning communication system, it becomes difficult to coordinate different functions both in case of a crisis, but also in the everyday life. Furthermore, the communication hubs are crucial for the transport industry, with the air traffic and shipping being dependent on a functioning communication system. Communication hubs themselves have a fundamental need of electricity. In case of a power outage, there are batteries and diesel engines that can generate power for some time. Due to the fact that the hubs generate great amounts of heat, there is a need of functioning cooling systems. Communication hubs are also important for the banking system, enabling transactions, as well as for the purchasing departments at various companies when placing orders.

Fridström mentions communication, energy, water, waste and transportation as important infrastructures. The water works are for instance dependent on tank trucks being able to deliver chemicals. Fridström also points out that all industries, especially producing companies, are dependent on water supply. The transportation system is therefore not just important in order to get employees and customers to working and shopping areas.
There is a dependency of attracting flows. Sturesson claims that they need to create an attractive shopping center in order to attract customers. The more people that shop in the center, the more interesting it becomes for the various retail chains to establish their stores there and the higher rents companies like Atrium Ljungberg can charge.

4.10.4 Collaborations

According to Winther, there are no collaborations between the hubs in Copenhagen; instead communication goes through the municipality. When it comes to the supporting hubs, the collaboration between the municipalities is evident. For instance, in Copenhagen there is not enough ground water so the city needs to obtain water from the neighboring municipalities. According to Fridström, there are also discussions of Sydvatten in Sweden selling water to Copenhagen in the future. There are as of now 20 municipalities in Denmark in need of water and the Danish water works are seen as potential customers rather than competitors to Sydvatten. Fridström also claims that companies in need of water supply, or those affected by disturbances, normally contact the municipalities. However bigger production companies, consuming a lot of water, such as food producing companies have a direct contact with the head office of Sydvatten.

Kristjansson and Lindell maintain that most collaboration takes place within sectors, industries and clusters. Malmö Copenhagen Port is one example of this. Between the hubs there is more competition than collaboration, but technology could however create more collaboration in the future. Continuous contact with politicians is needed in order to make them understand the importance of sustainable infrastructure. Pettersson claims that half of his time is spent on talking to politicians trying to convince them to invest more in the infrastructure related to CMP. Questions concerning overview planning are directed at the municipality and CMP is for instance now in collaboration with Malmö City, building a port section with a logistics center for one billion SEK. Connection roads to the railway are also built in collaboration with the municipality. According to Pettersson, CMP has a very good collaboration with the municipalities of both Copenhagen and Malmö, which is unusual since there are often a lot of conflicts between politicians and ports. CMP rapport to the municipality 3-4 times a year and even have people on the board of CMP involved in the municipality. Collaboration with the other ports is mostly only for gathering mutual statistics.

According to Kristjansson and Lindell, logistics connects the business world with infrastructure and transport. For instance, Pettersson claims that there is a lot of storage and refinement at the ports
and CMP are thereby collaborating with several transportation companies such as DHL and Schenker. Sturesson points out the importance of accessibility when getting customers to visit the shopping center. In order to increase bus traffic to Mobilia there are plans of collaborating with public transportation companies. Gunnefur states that many stores choose to advertise at the central stations in Scania and that it is good publicity for companies to be situated near them. Gunnefur also maintains that there is no collaboration between the hubs. However, he would find it interesting to have some sort of collaboration with Copenhagen Airport, due to its connection with the train system. The possibility of checking in at the central station when flying from Copenhagen Airport could be one example of such collaboration.

Some collaboration is based on technology. Persson points out that the RIX bank clearing system is owned by the Swedish state bank, with all the Swedish banks being members. The RIX system functions as a hub with all transactions between bank accounts going through it. The Swedish banks also own the corporation Bankgiro together. The banks are also members of Svenska Bankföreningen, where collaborations regarding mutual recommendations, regulations and lobbying, take place. Handelsbanken and the commerce in Malmö also collaborate with the police in order to reduce cash management.

4.10.5 Networks

All interviewees maintain that they are part of a network. However, the spread of the networks as well as the level of the network differ among the interviewees. Sturesson at Mobilia shopping center maintains that there exist networks for people and companies in the business both on local and national level. Members in the local area network include store managers. The managers at Atrium Ljungberg’s different shopping centers are also networking and cooperating. At a national level all shopping centers in Sweden are members of Svenskt Näringsliv. However, the membership is more of a social nature. The shopping centers are, after all, competitors and thus have no cooperation with each other.

Sturesson perceive the Danish and the Swedish markets as two different ones. Due to competitiveness and the fact that they have different clienteles, Mobilia does not have any cooperation with the shopping centers in Denmark except from being a member of the Nordic Council of Shopping Centers. The council represents the shopping center industry in the Nordic countries and members include different interest groups ranging from center managers, retailers,
suppliers and architects. Sturesson mentions the importance of creating himself a name in the industry that benefits him and the shopping center. Having good relationships with the tenants and other stakeholders in the business is of high importance and will facilitate the closings of agreements.

Bjoerner Soee at Fisketorvet shopping center in Copenhagen maintains that although the shopping centers are competitors to some extent, they still know a lot about each other’s businesses. In Denmark, the different shopping centers and their managers have regular meetings where they share knowledge. The owner of Fisketorvet shopping center is Unibail-Rodamco, a company operating more than 100 shopping centers in Europe and Fisketorvet works closely together with the Swedish shopping centers belonging to Unibail-Rodamco. Being the manager of Fisketorvet, networking is part of the job. Bjoerner Soee maintains that he does not belong to any formal network where he has any contact with the hub managers of the other categories.

Persson at Handelsbanken Malmö also confirms that he is a member of local networks as well as other business organizations. Since the banks are mainly competitors, there are no mutual networks for the banks. At the local level, networking is mainly performed by the office manager who is usually a member of different business associations. Rasmussen at Handelsbanken in Denmark maintains that Danish Handelsbanken is a member of the Danish Bank Association, which is an industrial collaboration of banks in Denmark.

Fridström at Vombverket claims that the water works are highly dependent on energy and therefore he has regular contact with the energy operation centers at E.ON and Öresundskraft. In case of a power outage, they have a direct number to a specific department at the energy companies that will provide them with help. Furthermore, Fridström maintains that he has weekly contact with the operating manager at Ringsjöverket, which is the other Sydvatten water work situated in the area. Sydvatten is a member of the organization Svensk Vatten and participates in seminars where experience is exchanged among the members.

Gunnefur claims that he is a member of several networks such as the Center for Property Owners. Different people within the organization of Jernhusen are members of different network organizations. Jernhusen is collaborating closely with the municipalities. The municipality of Malmö sees the importance of train stations as hubs and representatives from Jernhusen have monthly contacts with the municipality and they are mutually funding different projects. Managers at the different train stations belonging to Jernhusen have a close collaboration and contact with each other to share experiences. Gunnefur maintains that although many trains are going to Denmark
from Malmö, he does not have any contact with representatives on the Danish side. Instead he follows what happens in Denmark through Öresundsinstitutet.

The Danish Transport Federation is a lobby company, which uses network connections with politicians on a national and municipality level. Members of the federation include busses, trains, logistics, harbors, airport, aviation companies, networks and committees. Noack at DI Transport claims that there are politically common interests to function better and to generate activity by improving the networks among the members. Furthermore, Noack maintains that Oresundskommitten and NordLog function as cross-border organizations. Pettersson points out that CMP is a member of the regional goods transportation council with people from transport, production, air, shipping and road represented.

Most interviewees claim that they do not belong to any network where representatives from other industries or from the other hub categories are members. Instead, several interviewees explain that they contact the municipality and politicians when they want to affect hubs in the other categories. Bjoerner Soee maintains that if he wants to have bigger changes done or discuss more complex questions that concern the shopping center and its surroundings, he contacts people higher up the hierarchy. He claims that; “then you drink coffee with the politicians in Copenhagen or any other person that is of importance to the shopping center”. Rasmussen at Handelsbanken in Denmark agrees with Bjoerner Soee and claim that he does not have any contact with the hub operators at the hubs in the other categories, but instead contacts are made with politicians. Gunnefur maintains that Jernhusen often meets and works together with the county administrative board as well as the municipality.

4.10.6 Urbanization effects

Kristjansson and Lindell at Näringsliv Skåne claim that Scania is a polycentric region with complex networks. Malmö is a denser city compared to Stockholm and the interviewees maintain that Malmö is an attractive and appealing city with a comfort feeling. At the same time the inner city is relieved from traffic. Commuting in Scania is easy and there is a lot of intra-commuting with for instance big commuting parking spots. Winther at Copenhagen University maintains that the Oresund Region is an interesting study object in the sense that Copenhagen is a capital city with a high rank in the city hierarchy. Malmö on the other hand is one of the biggest cities in Sweden, but is located far from the capital and is thus almost isolated from the national economic capital. The capital of the region is
Copenhagen and Malmö is a city lower down the urban ladder. Furthermore, there is a significant
difference between Copenhagen and Scania, with Copenhagen having a high proportion of well
educated people, while the inhabitants in southern Sweden are far less educated. According to
Winther, regions have to specialize in different areas and within the Oresund Region it is possible to
see regional patterns of specialization.

Sturesson at Mobilia and Persson at Handelsbanken Malmö do not see any direct problems with
urbanization; instead they maintain that it has advantages related to their businesses. A growth of
the population is positive since it leads to increased numbers of potential customers. With more
people in the city, additional houses have to be built, which in turn benefits the banks’ businesses
through lending out more money. Persson also highlights the facts that urbanization makes it easier
to attract high quality employees in the larger cities. Bjoerner Soee agrees with Sturesson and
Persson and do not see any direct implications of urbanization. However, urbanization might alter
the demand on Fisketorvet. If new kinds of people move into the city, the shopping center needs to
adapt its segment to the new customers in order to be a successful shopping center. As an example
he mentions that people used to move to the suburbs when having a family. Today, many young
families tend to stay in the city and thus they are considered a “new kind of segment”.

Noack at DI Transport sees implications of urbanization on the infrastructure, with the ports, as well
as the city, affected by congestion. Companies today deliver to shops in rush hour. A lot of them use
the inner circle in Copenhagen, which is not made for transit. This statement also finds favor by
Gunnefur, who claims that if one does not invest in the infrastructure, there is a risk of bottlenecks.
Investing in high speed tracks would allow them to steal customers from the airline industry. When
planning the City Tunnel in Malmö ten years ago, the capacity was believed to be sufficient, but
today the use is at maximum capacity, with flows not being able to increase in the future. The
congestion in the western harbor in Malmö creates problems for the people living there. However,
this creates an opportunity for Jernhusen and Malmö Central Station, since many people might
consider commuting by train instead.

Fridström maintains that the population in Malmö has grown in recent years, much due to the
Oresund Bridge. Today there is an over capacity of the water production at Vombverket and
Ringsjöverket. Because of the over capacity there are negotiations with neighboring municipalities.
However, different scenarios in the future must be considered and for example a dry summer could
affect the water supply negatively.
Kristjansson and Lindell mention a number of projects that are important and will affect the development of the region; City Tunnel, Fehmarn Belt Bridge, Helsingborg-Helsingör Bridge, High-speed trains. The City Tunnel in Malmö, in combination with development, will be important for the region flows.

### 4.10.7 Obstructions

Since the region spans over two countries, there are certain national barriers affecting the flows. Gunnefur maintains that there are different systems of signal and power strengths (voltage) for the trains in Denmark and Sweden. Winther explains that in Denmark, the trains drive on the right side, whereas the trains in Sweden drive on the left side. This causes a problem when trains from Copenhagen go over the Oresund Bridge to Malmö. Currently, there is a reconstruction of Malmö Central Station which means that the passengers cannot go through the passenger lounge, but instead must walk around the station building, to be able to reach the tracks. This has decreased the number of visitors in the station building and has had a negative impact on the turnovers of those companies located in the building, according to Gunnefur.

According to Winther, another difference between the countries is the industrial systems. In Sweden, the industry is dominated by some bigger firms; these big companies are also partly controlling the infrastructure in Sweden. Denmark is more centralized in the sense that the only sector in Denmark dominated by multinational actors is the agricultural sector. When crises hits Sweden, the industry, and through that also the country, often suffer more than in Denmark. When it comes to the postal service, cell phone calls, taxes and so on, the national boarders actually hinders the region.

Pettersson mentions the importance of connecting transport roads to the major roads. If the connecting roads do not function properly, chances are that bottlenecks will be created. The terminals often become bottlenecks and some hours during the day are more critical than others. The ships are anchored in the port for only three hours and during this time four kilometers of trucks needs to be unloaded and reloaded. This requires an efficient railway and road infrastructure. Pettersson concludes that only passenger trains and no big freight shipments are allowed in Great Copenhagen. In Sweden and Norway there is a completely different opportunity for railway shipments, due to great distances within the countries.

Other obstructions caused by national laws take place within the banking system. According to Persson, the Danish and Swedish banking systems are different in the sense that most of the banks in
Denmark have a mutual network operator, whereas in Sweden each bank has its own platform. Kristjansson and Lindell maintain that the currency difference is another national factor affecting the Oresund Region, resulting in an increase of services on the Swedish side. Due to the low Swedish currency, Danish people go to Sweden to, for instance, service their cars and get haircuts. Furthermore, the housing prices in Malmö are significantly lower compared to Copenhagen. Despite the burst of the housing bubble in 2008, causing a 30 percent decrease of the Copenhagen housing prices, a lot of Danes still live in Sweden while working in Denmark.

However, the most obvious obstructions mentioned by the interviewees, were the problems that occur for people living in one country and working in another. Kristjansson and Lindell claim that Danish employers could end up paying double employment taxes and those living in Sweden while working in Denmark do not qualify for maternity/paternity leave. According to Pettersson there are no obvious obstacles for CMP, but the employees are affected by the different obstructions such as taxes, pay rolls and pensions. Pettersson does not see the language as any problem and meetings are always held in Swedish and Danish. Kristjansson and Lindell say that there is too much focus on barriers today and that the problems are actually solvable. Integration takes time, but the differences have driven the integration rather than hindered it.
5. Vital hubs in the Oresund Region

“Cities, like human brains, but unlike electronic systems, must modify their functionality without explicit intellectual control over every detail of the change.”

Coward & Salingaros (2004)

5.1 Systems of hubs

Summerton (1998) maintains that systems are important in order for Western societies to function properly. Having adapted a systems approach throughout this thesis, society is viewed holistically with the whole considered greater than its parts. Investigating how the parts are related to each other is of importance and the parts can be defined only in relation to the whole (Arnbor & Bjerke, 1997; Lundahl & Skärvad, 1999). In this thesis, urban agglomerations are seen complex institutions that are dependent on various features in order to operate successfully. These crucial features were identified as hubs and they are both considered as components in the systems of cities as well as systems of their own. The operation of these hubs is important for a well functioning society. According to Summerton (1998) every system is an integrated part of the society in which it is developed. Churchman (1973) further states that systems are always embedded in larger systems; the bigger the system the more interaction between its parts. This was found true when conducting the case study of the Oresund Region. Throughout this thesis, hubs have been considered systems embedded in the larger system of cities, crucial for the function of urban agglomerations such as the Oresund Region. This is exemplified in figure 7, depicting the Oresund Region and the cities investigated. The interconnectivity of these cities is illustrated by the lines in between. Each city contains subsystems of their own, in this case the hubs pictured in the lower circle representing the city of Copenhagen. However, the connections in the model merely function as an example of how systems of systems may be connected and is not a real description of the Oresund Region.
Due to the fact that systems contain variables, which are subject to influences not possible to predict or control, they are difficult to comprehend. The complexity is also shown by the degree of invisibility of systems, and most of us do not even realize they are there until something goes wrong. The disturbances during the last year, such as the transport system being impaired, has made many people aware of the connections and impacts different disorders can afflict. The high vulnerability of these systems is connected to the strong dependence of the flows of people, goods, capital and service. The commotion during the spring of 2010 has shown that a disruption in one hub can have ripple effects and severely affect the movement of important flows. For instance, the disturbance caused by the Icelandic volcano eruption, with impacts on the whole airline industry, resulted in flows of people and goods not being able to reach their desired destination. With important inputs unable to be delivered, such as electronic components, production industries were severely impaired and in the end there were economic losses related to other industries than just the airlines.
5.1.1 The hub categorization model

In order to be able to answer the research questions, a division of the hubs were found necessary. Based on the flows of people, goods, capital and service, the hubs were divided into three different categories: transport, economic and infrastructure hubs. The transport hubs connect two flows, people and goods; the economic hubs connect flows of capital and the infrastructure hubs connect flows of service. Even though transport hubs could be considered a part of the infrastructure, the fact that they handle two out of the four flows and are perceived to be very important for the other hubs, motivates them being given a category of their own. The hub concept is also clearly defined in transport theories, which contributes to this choice of division. This categorization, illustrated in figure 8, is a contribution to the hub concept, providing both an overview of different hubs, as well as depicting the connections to the other hub categories. The hub categorization model only depicts the interconnectivity between the hub categories and does not show the relations between hubs within the same category.

The hub categorization model is a tool to identify important hubs in an urban agglomeration. The three circles represent the hub categories and are equal in size since they are considered equally important for the function of society. Although operating individually, the hubs are always mutually

Figure 8 - The hub categorization model
dependent on each other to some extent. Hughes (1989) claims that if one component is removed or altered from the system, other parts will be affected. Thompson (2003) agrees with this and claims that if dysfunctional parts are not adjusted, or disengaged, the whole system will degenerate. This is illustrated by the circles overlapping in the hub categorization model. The core is central to the model, showing the complexity and the fact that the parts can only be understood by their relation to the whole. It is suitable to place the hubs in the different parts of the circles, since some hubs are more interconnected than others. Different hubs have lower and higher connectivity with the other hub categories. Those connected to all three categories have been placed more central in the model.

The hub concept is clearly defined within the transport category, but when it comes to the other categories the hub concept does not seem to exist. This was apparent when conducting the interviews, with people related to the economic and infrastructure hub categories having difficulties defining a hub, as well as understanding the hub concept. Literature also addresses the hub concept within transport and communication. The concept of economic hubs does not exist in theory; neither are water works, energy plants, knowledge units and other infrastructure systems considered hubs in the theory. One could argue that the nonexistence of economic and infrastructure hubs as a concept is explained by that there is simply no need for it. However, in order to give a holistic depiction of the Oresund Region, it became necessary to introduce the concept of economic and infrastructure hubs. Without a mutual concept for all three categories it is difficult to compare and describe the whole system, since systems are considered impossible to analyze through their individual parts alone.

Alumur and Kara (2008) chose to define hubs as special facilities that serve as switching, transshipment and sorting points in many-to-many distribution systems. Hesse (2010) sees hubs as points located in between other places. The empirical results coincide with the theoretical definition of a hub. Words such as switching points, national and international connection points, concentrated distribution centers and meeting points are used by the interviewees to define a hub. Bjoerner Soee at Fisketorvet indicates that hubs are not endpoints and that flows only pass through hubs on their way to somewhere else. Persson at Handelsbanken points out that an economic hub could be seen as a market place or a meeting point. Throughout this thesis, hubs are perceived as connection points for the flows of people, goods, capital and service. The difference between hubs and nodes was identified with nodes having the ability to be both origins and destinations and hubs being located in between. Hubs can be characterized as important based on their flow-intensity, location, availability and connectivity to other hubs.
The transport hubs are connection points for the flows of people and goods. In the hub categorization model, transport hubs are identified as airports, combi terminals, ports and train stations. Theory, as well as empirical results, shows that the transport sector is crucial for the economy and that other sectors are highly dependent on the transport system. In the Oresund Region, Copenhagen Airport is mentioned as the most important hub by the majority of the interviewees. The airport is connected to both other transport hubs, such as train stations and ports, as well as economic hubs with business life being dependent on transport and a global link to the rest of the world.

The airport itself does not function without infrastructure hubs. Above all, electricity and communication is vital for the operation of the airport. The airport hub is placed centrally in the hub categorization model, due to its connection with all three hub categories. The ports in the Oresund Region have also been pointed out as important hubs, with several industries completely dependent on them. The airports and ports make the Oresund Region more accessible and thus also increase the attractiveness.

Trains were also identified as important transport hubs. With travelling by trains estimated to double within ten years, mostly because of commuters, the importance of these hubs might become even bigger in the future. Train stations are connected to the business life, in getting both customers and employees to their destinations. The train stations themselves are dependent on infrastructure hubs of electricity and communication. Due to the different connections, the train stations are placed rather centrally in the hub categorization model. Combi terminals are the fourth transport hub type identified in the Oresund Region and through their intermodal quality they are connected to the other transport hubs. Since economic hubs, such as shopping centers and warehouses, rely on a continuous deliverance of goods, these intermodal combi terminals are placed adjacent to the economic hub category.

The economic hubs are transaction points of capital. As previously pointed out, the term economic hub is not addressed in literature. However, several authors such as Sassen (2001; 2000), Scott (2001) and Thrift (1986) discuss the global flows of capital, pointing out global cities as important locations for financial transactions. This provided the motivation to investigate important economic transaction points in the Oresund Region. With no clearly defined economic hub concept, the hub definition described within the transport sector was expanded to the new concept of economic hubs. Using the hub definition provided by Alumur and Kara (2008), economic hubs are seen as special facilities serving as switching, transshipment and sorting points in many-to-many distribution.
systems. Economic hubs can thus be considered market places where transactions of capital take place.

The identified economic hubs in the Oresund Region are attraction centers, financial centers, shopping centers and warehouses. Financial centers such as banks have a need for a well functioning society and society is also dependent on banks, as a lubrication system, in order to have the development of today. Banks are connected to the transport hubs in the sense that a well developed transport system is required in order for customers and employees to reach the offices. Banks are connected to the infrastructure hubs through the dependency of electricity and communication, as well as a developed broadband infrastructure for their customers. Today, due to technological developments, bank offices are less important than the actual infrastructure and with people nowadays doing their businesses online there is less connectivity with the transport hubs. Shopping centers and attraction centers are more dependent on an accessible transport system in getting customers and employees to the centers. Shopping and attraction centers have therefore been placed closer to the transport category than financial centers in the hub categorization model. Since the centers are also very dependent on electricity they are placed close to the infrastructure category.

*Infrastructure hubs* are connection points for flows of services, and the identified infrastructure hubs in the Oresund Region are communication centers, energy plants, research centers, water works and waste centers. The infrastructure hubs are crucial for the city to function properly and communication and energy hubs are considered the most important. Internationalization has also led to many functions being located outside of Sweden, making it even more important to uphold electronic cross-border communication. The energy plants and communication centers are placed centrally in the model due to their connectivity to the other two categories. A well developed infrastructure is vital for the attractiveness of the Oresund Region. If the region does not have functioning infrastructure hubs, businesses will not be interested in establishing themselves there. Several infrastructure hubs are even fundamental for some industries. Production companies, for instance, are highly dependent on the water supply in their production processes. Waste management also contributes to the attractiveness of the region and is in turn dependent on a functioning transportation system. This is depicted in the hub categorization model.

Although not being actual hubs, *feeder lines* were identified as important elements when investigating the Oresund Region. With hubs being the connection points in a network, feeder lines are the routes in between, feeding the different hubs with flows. Feeder lines identified in the
Oresund Region were bridges, railways, roads, electric and communication grids, leading the flows forward in between the hubs. The Oresund Bridge is a feeder line that has contributed extensively to the development and integration of the region.

5.2 Interconnectivity

According to systems theory (Churchman, 1973), interconnectivity can be explained by all parts of a system interacting with and relying on one another. Like in an ecosystem all inhabitants play a part in maintaining that system in a dynamic equilibrium. An impact on one part of the system eventually affects the entire system. The high vulnerability of the systems investigated in this thesis is connected to the strong dependence of the flows of people, goods, capital and service.

Attracting flows have shown to be crucial for the survival and growth of cities and urban agglomerations (Kotler et al, 1993). Without these flows, cities and regions will lose its appeal, and people and businesses will choose to move elsewhere. The mobility of the flows is necessary for economic growth and the importance of accessibility has increased the connectivity, which has in turn shown to be increasingly important for inter-urban competition. Hubs are the connection points for functioning networks and being located close to these hubs is critical for the performance of many businesses. For instance, several industries are completely dependent on the ports, which are important hubs for the flows of goods and people. Flow intensive facilities are likely to be located around transport hubs in order to generate and attract major flows. The availability of the hubs is an important parameter in relation to the quality of the hubs and thereby also for the competitiveness of the region.

The importance of the hubs can also be measured through flow intensity or the connectivity and accessibility of the hubs. For instance, in order for goods and people to reach their destination, a well developed transport system that increases the accessibility is required. The different parts in a system are interdependent in the sense that unless they perform adequately the total system might be jeopardized. The failure of one component endangers the whole, which in turn each part is supported by (Thompson, 2003). The networks’ nature of interconnectivity makes them more vulnerable to failures and in case of a failure consequences can be widespread. With most stores today using a just-in-time system the dependency of a continuous flow of goods is higher than ever. With this just-in-time system, goods are stored “on the move”, rather than in physical warehouses. In case of a disruption in the transport system, causing a delay in truck deliveries, stores would run out
of supplies within days. In order to manage disturbances in complex interactive networks it is important to have a basic understanding of the true system dynamics. There are many challenges that occur in interactive network systems. One example is the increase of the number of possible interactions due to the growth of participants (Amin, 2000).

Today almost all economies and social functions depend on the secure, reliable operation of infrastructures. However, with time these infrastructures have grown more complex handling a great amount of different demands and they have also become more interdependent. With a development of technical systems doing the work people used to do, a disruption in the system could have more widespread impacts, since the solution to the problems cannot be handled directly and only by people (Amin & Horowitz, 2008).

Systems have the characteristics of enabling other systems (Summerton, 1998). For instance, electricity is a prerequisite for the transport and communication systems. Communication is in turn an example of an interdependent infrastructure function. The dependency on communication has increased the demand for reliable and disturbance-free electricity. Many functions in society today, such as banking and financial systems, rely on electric power and communication systems. The transport system is also dependent on communication and power. With the transport sector being a supplying sector, a disruption would have widespread effects on many critical functions in society depending on deliveries, such as municipal utilities, health care and food supply. A disruption in the financial sector, for instance if no payments can take place, also has widespread effects on the whole society. Energy, communication, transportation and financial infrastructures are becoming more and more interconnected.

In order to model complex interactive networks, the rationality of the human thinking needs to be examined. According to Thompson (2003), complex interactive networks can be seen as multi-layered and multi-intertwined grids with different levels of interdependence to consider. Complex systems are built up by reciprocal dependencies; less complex systems have sequential dependencies; whereas all systems have some kind of pooled dependence affected by the whole. The most complex systems have a combination of reciprocal, sequential and pooled interdependence. The Oresund Region is a complex interactive system, with different levels of dependencies. In order to describe the different dependencies in the Oresund Region the hub relationship model, illustrated in figure 9, was created.
5.2.3 The hub relationship model

The hub relationship model was created with inspiration from the network flow chart by Churchman (1973). The dependencies have been identified through research and interviews within the field of study in the Oresund Region. The different layers represent the different hub categories previously created; transport, infrastructure and economic hubs, but there is no hierarchical order between them. The symbols in the model correspond to the hub types shown to the left of the model.

Within the hub categories, intra-relationships of sequential and reciprocal dependencies are portrayed by the dashed arrows. Between the layers, inter-relationships of dependencies are shown by solid lined arrows. The arrows point at the hub types or hub categories they depend on. For instance, in the Oresund Region, the whole transport sector is dependent on communication and electricity and the economic hubs are dependent on the transport sector. Some connections are mutual and thus depicted with a reciprocal dependency. For instance, warehouses and shopping centers have a mutual dependency. A sequential, one-way, dependency is shown by the arrow from shopping centers to financial centers. Without financial centers, the possibility of receiving payments from customers is not possible, or at least reduced.
The darker left panels of the different layers depict the interdependencies of a whole hub category. The arrows pointing at a panel reflects that there is a dependency of that whole category. An arrow originating from a panel shows that category’s dependency of what the arrow points at. The inter-relationships of the hub categories in the Oresund Region were found to be sequential. The economic hubs are dependent on the transport hubs, in order to get customers, employees and goods to their destination. Logistics seem to connect the business world with infrastructure and transport.

The different dependencies require different levels of coordination. Thompson (2003) claims that the most complex organizations use coordination by mutual adjustment, often involving coordination across hierarchical lines. Furthermore, complex systems tend to be self-adapting to changes. Even though this seems to be the case with the Oresund Region, some form of hierarchal coordination was found, with the municipalities functioning as a mediator in the communication between the hubs. When enforcing changes, the interviewees pointed out the importance of working together with the municipalities.
Infrastructure networks consist of several functional, operational and management levels. The stakeholders function together in a network and are considered complex since the number of interactions rises at a higher rate than the number of members in the network. The importance of collaboration grows with the complexity of the networks.

5.3 Collaboration

Today, there is no single entity that has complete control over all these highly interactive networks, or with the ability to evaluate, monitor and manage the hubs in real time (Amin, 2002). The problems cities are facing are therefore in need of complex solutions, requiring continuous collaboration between different levels of governance, such as local authorities, regions and states. The different levels of collaboration in society could be seen as taking place on different levels, for instance on a strategic level, a tactical level and an operational level (STMØ, 2006), illustrated in figure 10. The need for continuous collaboration between the levels is portrayed by the arrows between the layers in the illustration. Although all levels are needed in order for society to function, this study has focused on the operative level, where the daily flows are handled by hubs.
The collaboration in the Oresund Region was predominantly discovered through the empirical part of the research and the low level of collaboration between the different hubs was pointed out by several of the interviewees. Communication instead goes through the municipalities on the tactic level. Continuous contacts with politicians are necessary for investments and changes. For instance, Pettersson at CMP claims that half of his time is spent on talking to politicians, trying to make them aware of the importance of different infrastructure investments. Most collaboration takes place within sectors, industries and clusters and the hub operators are usually members of industrial networks. However, most interviewees claim that they are not members of any networks were representatives from other industries and hub categories are members. Between the hubs of the same type there is more competition than collaboration, but technology could create more collaboration opportunities in the future. Today there are numerous collaborations based on technology such as the different bank systems.

In this thesis, cities and hubs are seen as series of systems overlapping other systems. City administrations do not seem to have a satisfactory system perspective, with important city operations divided into different authorities with no mutual governance. The limit of control by human operators on technical systems could be an explanation for city administration becoming more difficult every year. In the Oresund Region, the governance and planning of cities is a municipal responsibility. However, numerous networks of cities, regions and private organizations have emerged in order to promote cooperation, with the attempt of organizing or reorganizing structure which goes beyond inter-municipal cooperation (Nousiainen, 2001). In order to enable regional cooperation and integration, transport connections have been important. For instance, Nordlog and Øresundsinstitutet are examples of such regional collaborations. Transport hubs, such as train stations, have played a vital role in integrating Sweden and Denmark in the Oresund Region. The Oresund Bridge has increased the commuting across the border as well as the integration, and is a great example of regional collaboration across country borders. Transport and town-planning are inter-linked with a great number of different networks, with transport operators important in the management of town-planning, especially regarding big investments. This is shown to be true in the Oresund Region, with transport hubs such as CMP and the train stations of Jernhusen having a close collaboration with the municipality. Although collaboration is extremely important for a region such as the Oresund Region, collaboration is many times difficult due to the many participants in the system.

According to Thompson (2003), organizations crossing national borders tend to establish region based semi-autonomous division do the strong variation between countries. Both CMP as well as the
Oresund Bridge are examples of such region-based divisions. Due to constraints caused by the different systems between Sweden and Denmark a lack of collaboration could cause barriers that obstruct the different flows.

The findings of this thesis indicate that there is an interaction between different levels of collaboration in the Oresund Region. On the operative level, systems tend to be self-adapting and are able to handle the daily flows. However, changes demanding a more long term perspective, often involves collaboration on a strategic or tactic level, with politicians connected to municipalities and governments. There are different ways of looking at collaboration. In this thesis it has been viewed as working together in order to obtain something not possible on your own. Sharing information and enforcing developments have been seen as two reasons for collaboration. Collaboration could either be based on common interests or on one-way/mutual dependencies. In the Oresund Region, different forms of collaborations were identified with some based on dependencies and others on common interests. The research indicates that collaboration between hub types are mostly based on dependencies and collaboration within hub types are mostly based on common interests. One reason for this is that hubs within the same type are usually competitors and thus not dependent on each other. Due to the interconnectivity of systems, dependencies are likely to be established between the different hub types.
6. Connectivity and collaboration

“It is critical that the interrelationship between a city’s core systems is taken into account to make this ‘system of systems’ smarter, too. No system operates in isolation; instead, a web of interconnections exists.”

IBM (2009, p. 10)

6.1 The most important hubs in the Oresund Region

In order to answer the research questions, a division of the hubs investigated in the Oresund Region were found necessary. Due to the urban agglomerations strong dependence of flows of people, goods, capital and service, the hubs of these flows were identified. The hub categorization model was thereby created, with the categories of transport, infrastructure and economic hubs, as a tool to identify a region’s most important hubs. The transport hubs connect two flows, people and goods; the economic hubs connect flows of capital and the infrastructure hubs connect flows of service. Although transport hubs could be defined as an infrastructure, the fact that they handle two out of the four flows, and that they seem to have such an impact on the other hubs, made it necessary to make them a separate category. All three hub categories were found equally important for the Oresund Region, illustrated by the circles being equal in size and merged in the center.

During this study, the most important hubs in the Oresund Region were found to be those having a high level of flow intensity, availability, accessibility and connectivity. The transport hubs in the Oresund Region were identified as airports, combi terminals, ports and train stations. With no existing definition of economic and infrastructure hubs, the hub definition described within transport was expanded and applied to these hubs as well. The identified economic hubs in the Oresund Region were attraction centers, financial centers, shopping centers and warehouses. The identified infrastructure hubs in the Oresund Region were identified as communication centers, energy plants, research centers, water works and waste centers.

Theory as well as empirical result show that transportation is crucial for the economy and that several other sectors are dependent on the transport system. The airports of Copenhagen and Malmö are important hubs in the Oresund Region, connected to both other transport hubs, such as train stations and ports, as well as economic hubs, with business life being dependent on their global connection. The ports of the Oresund Region have also been pointed out as important hubs with
several industries completely dependent on them for handling the flows of goods and people. It was concluded that airports and ports are necessary in order to make the Oresund Region more accessible and thus increase the attractiveness. Train stations were also found important for the region, with a high number of commuters within the region and across the border. Travelling by train is estimated to double within ten years, and may thereby increase the importance further. The transport hubs were found crucial, especially since they are connecting points for both flows of people and goods.

The infrastructure hubs are crucial for the city to function properly and communication and energy hubs were found to be among the most important hubs. A well developed infrastructure is vital for the attractiveness of the region. The economic hubs increase the attractivity of the region and enable a successful business life. Banks function as lubrication to the system and without them, investments and developments would not take place as much. Furthermore, they facilitate the payments in society and thereby the flows of capital.

Although feeder lines are not considered hubs themselves, they are extremely important in feeding the flows between the different hubs in a network. Identified feeder lines in the Oresund Region were bridges, railways, roads, and electric and communication grids. The Oresund Bridge has for instance contributed extensively to the past decade’s development and integration of the region. For the Oresund Region, a dynamic system of all the hubs, including the feeder lines, were found necessary for the attractiveness and functionality.

6.2 The connectivity of the hubs in the Oresund Region

Attracting flows are crucial for the survival and growth of cities. For an inter-urban competition the dependence of connectivity has shown increasingly important. The mobility of flows is necessary for economic growth and the importance of accessibility has increased this connectivity. Throughout this study, society has been viewed holistically, with the whole considered greater that its parts. Systems are important for the function of Western society and always embedded in larger systems; the bigger the system the more interaction between its parts. This was found true when conducting the case study of the Oresund Region. Throughout this thesis, hubs have been considered as systems embedded in larger systems, for instance those of cities. The networks’ nature of interconnectivity makes them more vulnerable to failures and in case of a failure, the consequences can be
widespread. Systems have the characteristics of enabling other systems. Electricity is for instance a prerequisite for the transport and communication systems.

Energy, communication, transport and financial infrastructures are becoming more and more interconnected and today almost all crucial economies and social functions depend on the secure, reliable operation of infrastructure. However with time these infrastructures have grown more complex handling a great amount of different demands and they have also become more interdependent. With the transport sector being a supplying sector, a disruption would have a ripple effect on many critical functions in society depending on deliveries, such as municipal utilities, healthcare and food supply. Most stores today use a just-in-time system and are dependent on a continuous flow of goods, making them even more vulnerable of disturbances.

The hub relationship model was created in order to illustrate how the hubs in the Oresund Region are connected to each other. Through the interviews it was concluded that there were different levels and types of dependencies. Between the categories inter-relationships were identified and within categories intra-relationships were recognized. Mutual dependencies were found between many of the hubs, and between some there were one-way dependencies. The whole economic hub category was found to have a sequential dependency on the transport category, and the transport hub category, as well as the economic hub category, was found to be dependent on the communication and energy hubs. The Oresund Region is viewed as a complex system, with a combination of reciprocal, sequential and pooled interdependencies.

6.3 The collaboration of the hubs in the Oresund Region

The most complex organizations use coordination by mutual adjustment, often involving coordination across hierarchical lines. With no single entity in control, systems tend to be self-adapting to changes. Even though this also seems to be the case with the Oresund Region, some hierarchical form of coordination was found, with the municipalities functioning as a mediator in the communication between the hubs. In the Oresund Region the low level of collaboration was pointed out by several of the interviewees. The empirical result showed that there are no collaborations between the different hubs. The collaboration instead goes through the municipalities on the tactic level. This is illustrated in the levels of collaboration model. Continuous contacts with politicians were found necessary for investments and changes. Most collaboration takes place within sectors, industries and clusters, with more intra-relationship than inter-relationships. Between the hubs of
the same hub type there is more competition than collaboration, but technology could create more collaboration opportunities in the future. In order to enable regional collaboration and integration, transport connections have been important. Therefore transport hubs enabling the border-crossing commuting have been crucial in integrating Sweden and Denmark in the Oresund Region.

6.4 Suggestions for further research

The models developed throughout this study are recommended to be used in a chronological order when conducting a study with similar research questions. The first step is mapping the most important hubs by using the hub categorization model. Thereafter, the connectivity between the hubs could be investigated and depicted by using the hub relationship model. Finally, the collaboration could be analyzed with help of the levels of collaboration model.

In this thesis, focus has been put on describing a holistic picture and the delimitations necessary did not allow us to investigate each hub category thoroughly. A need for further research of especially economic and infrastructure hubs were identified throughout the study. With this being a single-case study, it would be interesting to apply the findings of the thesis on other cases and also on other levels. City regions were the magnifying hub level for this thesis due to chosen delimitations. However, conducting the study on other levels, such as cities, countries or even in an international context, could be rewarding. Furthermore, with the Oresund Region being a polycentric city region, it would also be interesting to conduct the study on a monocentric city region, to investigate if the results coincide or differ. The level of hub connectivity and collaboration for instance, could be assumed to vary depending on the number of cities involved. Finally, since the important hubs in this study were identified mostly by interviewing key people in the Oresund Region, a more quantitative study, investigating the hubs’ flow intensity, could be executed.
References

Attendance at meetings

**Saab Technologies and City planning office of Malmö, 17th of February 2010, 13:00-15:00**
Bertil Johansson, City Planner

Conferences

**Nordlog Conference, 2010**
Øresund Logistics: NordLog Kick off Konference - 5 initiativer der løfter hovedstadens logistiksektor,
Copenhagen, Monday the 22nd of March 2010, 09:00-15:00

Interviews

**Bjoerner Soee**, Henrik - Shopping Center Manager
Fisketorvet, Tuesday the 23rd of March 2010, 13:00-14:10

**Fridström**, Lars-Anders - Local Manager
Sydvatten, Vombverket, Wednesday the 14th April 2010, 09:00-10:00 (Telephone interview)

**Gunnefur**, Ola - Property Manager
Jernhusen, Friday the 16th of April 2010, 08:20-09:40

**Kristjansson**, Gudmundur - Assistant Business Manager
Näringsliv Skåne, Thursday the 18th of March 2010, 14:00-16:00

**Lange**, Carl-Johan - IP Core Net Planner
TeliaSonera, Monday the 3rd of May 2010, 11:20-12:00 (Telephone interview)

**Lindell**, Christian - Analysis Manager
Näringsliv Skåne, Thursday the 18th of March 2010, 14:00-16:00
Noack, Rune - Business Policy Advisor
DI Transport, Monday the 22nd of March 2010, 15:00-15:35

Olshov, Anders - CEO
Øresundsinstitutet, Friday the 19th of March 2010 14:30 – 15:00

Persson, Anders - Bank Manager
Handelsbanken Region Södra, Friday the 19th of March 2010, 13:00-14:10

Pettersson, Lennart - Deputy Manager Director
CMP, Thursday the 15th of April 2010, 13:20-15:00

Rasmussen, Allan - Manager International Payment Services
Handelsbanken, Copenhagen, Wednesday the 14th of April 2010, 11:00-11:45 (Telephone interview)

Sturesson, Göran - Shopping Center Manager
Mobilia Shopping Center, Friday the 19th of March 2010, 10:30-11:30

Winther, Lars - Human Geographer
Copenhagen University, Tuesday 23rd of March 2010, 10:00-11:15

Articles


**Books**


Donne, J. (1624), *Devotions upon Emergent Occasions*


Jacobsen, D. I. (2009), "Vad hur och varför? Om metod i företagsekonomi och andra samhällsvetenskapliga ämnen", Studentlitteratur, Malmö


Kvale, S. (2008), Den kvalitativa forskningsintervjun, Studentlitteratur, Lund


Electronic sources

demographia.com
http://www.demographia.com/db-worldua.pdf, 2010-02-12

dn.se, a

dn.se, b

europa.eu
http://ec.europa.eu/environment/eussd/, 2010-02-15

hks.harvard.edu
http://www.hks.harvard.edu/sustsci/ists/docs/whatisSD_env_kates_0504.pdf, 2010-02-15

lboro.ac.uk
http://www.lboro.ac.uk/gawc/gawcworlds.html, 2010-02-05

nyheter24.se
oresundskomiteen.dk
http://www.oresundskomiteen.dk/Fakta-og-publikationer/Dette-er-Oresundsregionen 2010-02-12

oresundsregionen.org
http://www.oresundsregionen.org/About.aspx, 2010-02-15

unfpa.org

swedavia.se
http://www.swedavia.se/en/Malmo-Airport/About-the-airport/Cargo/, 2010-04-02

Reports

CMP, 2009
CMP Annual Report, Copenhagen Malmö Port

Eurocities, 2007
Eurocities for Sustainable Urban Mobility: Strength through Diversity, Eurocities

DI, 2010
Danmark er et transportland, Danish Industry

FMER, 2004
The Urban Transition: Research for the sustainable development of megacities of tomorrow, Federal Ministry of Education and Research

IBM, 2009
A Vision of Smarter Cities: How Cities Can Lead the Way into a Prosperous and Sustainable Future, IBM Global Business Service, IBM Institute for Business Value

IBU-Øresund, 2009a
International tilgængelighed i Øresundsregionen, Øresundsregionen som internationalt transportknudepunkt, IBU-Øresund

IBU-Øresund, 2009b
Knudepunkter og infrastrukturlinjer for international person- og godstransport i Øresundsregionen, Øresundsregionen som internationalt transportknudepunkt, IBU-Øresund
IBU-Øresund, 2009c
Trafik i vigtige korridorer i Øresundregionen, IBU-Øresund

Malmö Stad, 2009

MSB, 2009
Faller en – faller då alla? En slutredovisning från KBM:s arbete med samhällskritiska beroenden, Myndigheten för samhällsskydd och beredskap

Region Skåne, 2008
Systemanalys för infrastrukturen i Skåne – Underlagsarbete till långsiktig åtgärdsplanering av infrastrukturen i Skåne 2010-2020, Region Skåne

Region Skåne, 2009
Vision för Skåne, Region Skåne

Saab, 2008
Saab Annual Report, Saab

Saab, 2009
Busy Town, Saab

SOU, 2007
Strategiska godsnoder i det svenska transportsystemet – ett framtidsperspektiv, Statens Offentliga Utredningar

STMØ, 2006
Transportstruktur och ekonomi – en analys av transportbarriärer i Öresundsregionen, Delrapport 1:3, Strategic Transport Management i Øresundsregionen

Vägverket, 2010
Systemanalys, Vägverket

Øresundsinstitutet, 2007a
Øresundsinstitutet, Sep-Nov 2007

Øresundsinstitutet, 2007b
Øresundsinstitutet, Dec 2007
Øresundsinstitutet, 2008a
Øresundsinstitutet, Sep-Nov 2008

Øresundsinstitutet, 2008b
Øresundsinstitutet, June-Aug 2008

Øresundsinstitutet, 2009a
Øresundsinstitutet, Dec 2008-Feb 2009

Øresundsinstitutet, 2009b
Øresundsinstitutet, Oct 2009
Appendix

Template for the interviews

- **HUBS**
  - How would you define a hub?
  - What hubs in the region do you consider important?
  - Which hubs are the most important for your hub/business?
  - How important is your hub in comparison to the other hub for the region?
  - Are there any hubs more central than others in the region?
  - How is your hub connected to other hubs (transport/economic/infrastructure hubs)
  - How will an increased urbanization affect your hub?
  - How does collaboration with other hubs play out?
  - Are there any important hubs missing on our map?

- How would you define feeder lines?
- Which are the most important feeder lines in the region?

- **COLLABORATION**
  - Do you have any contacts with other hubs in the region?
  - Is there any collaboration between the hubs?
  - Is there any collaboration across the different sectors?
  - Is there any collaboration across the border?
  - Who do you collaborate with?
  - Are you a part of any networks/organizations (business, political, private)?
  - Are there any specific platforms important for your hub?
  - Are there any specific regulations (laws, systems, environmental demands)?
  - Are there any specific players important to your hub?
# Mapped hubs in the Oresund Region

<table>
<thead>
<tr>
<th>TRANSPORT HUBS</th>
<th>ECONOMIC HUBS</th>
<th>INFRASTRUCTURE HUBS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copenhagen Airport Kastrup</td>
<td>Malmö Arena</td>
<td>Copenhagen Communication Center</td>
</tr>
<tr>
<td>Malmö Airport Sturup</td>
<td>Parken Stadium</td>
<td>Malmö Communication Center</td>
</tr>
<tr>
<td>Ångelholm Helsingborg Airport</td>
<td>Swedbank Stadium</td>
<td>Lund Communication Center</td>
</tr>
<tr>
<td>Tivoli Amusement Park</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Copenhagen Malmö Port, Copenhagen</td>
<td>CCC Shopping Area</td>
<td></td>
</tr>
<tr>
<td>Port of Helsingborg</td>
<td>Center Syd Shopping</td>
<td>Copenhagen University</td>
</tr>
<tr>
<td>Port of Trelleborg</td>
<td>Fisketorvet Shopping Center</td>
<td>Lund University</td>
</tr>
<tr>
<td>Port of Ystad</td>
<td>HCC Shopping Area</td>
<td>Technical University of Denmark</td>
</tr>
<tr>
<td>Copenhagen Central Station</td>
<td>Jägersro Shopping Center</td>
<td>Allbäck’s Waste Center</td>
</tr>
<tr>
<td>Helsingborg Central Station</td>
<td>Lyngby Shopping Center</td>
<td>Damhusåen Waste Center</td>
</tr>
<tr>
<td>Kastrup Station</td>
<td>MCC Shopping Area</td>
<td>Hedeskoga Waste Center</td>
</tr>
<tr>
<td>Lund Central Station</td>
<td>Mobilia Shopping Center</td>
<td>Lund Waste Center</td>
</tr>
<tr>
<td>Malmö Central Station</td>
<td>Rødovre Shopping Center</td>
<td>Lynetten Waste Center</td>
</tr>
<tr>
<td>Nørreport Station</td>
<td>Triangeln Shopping Center</td>
<td>Spillepeng Waste Center</td>
</tr>
<tr>
<td>Svangertorp Station</td>
<td>Väla Shopping Center</td>
<td></td>
</tr>
<tr>
<td>Trelleborg Station</td>
<td></td>
<td>Islevbro Water Works</td>
</tr>
<tr>
<td>Ystad Station</td>
<td>ICA Central Warehouse, Arlöv</td>
<td>Ringsjöverket Water Works</td>
</tr>
<tr>
<td></td>
<td>ICA Central Warehouse, Helsingborg</td>
<td>Søndersø Water Works</td>
</tr>
<tr>
<td></td>
<td>Toyota Central Warehouse</td>
<td>Vombverket Water Works</td>
</tr>
<tr>
<td></td>
<td>Unicef Central Warehouse</td>
<td></td>
</tr>
</tbody>
</table>