Data Sharing Within Connected Business Ecosystems

- A study of an automotive business ecosystem

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"Either you're Armstrong, or you don't exist."

- Anders Veen Huis, Scania

Abstract

Title: Data sharing within connected business ecosystems – A study of an automotive business ecosystem

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Problem Definition: Connectivity, data sharing, big data and Internet of Things (IoT) are topics frequently discussed within society, corporations and governmental institutions across the world today. All prestigious consulting firms and the world's largest software developers are continuously publishing new articles on the subject. Inevitable, buzzwords such as "IoT", "Industry 4.0" and "Industrial Internet" are on the contemporary management agenda.

Since the early 1990's, the visions and potentials of integrating the IoT within industries have evolved. However, there are few successful implementations to be found. Around the world, the utilization of sharing data, and how businesses can benefit from their connected products, are being discussed. Further more, questions regarding how governments and institutions should support the development, and what obstacles businesses and societies will face when trying to get there, are also being discussed. The viewpoints from different actors and industries must be compared and combined, in order for the networked society to reach its full potential.

Purpose: The purpose of this master thesis is to identify important factors to consider when developing business models for data sharing within connected business ecosystem.

Methodology: Qualitative research with an inductive approach. Semi-structured interviews were conducted with nine actors within an automotive business ecosystem. Inputs from the interviews were analyzed together with theories and secondary data on the subject connectivity and data sharing. The Business Model Canvas (Osterwalder & Pigneur, 2010) was used as a tool for the analysis.

Conclusions: In the connected automotive business ecosystem, two categories of products, the connected product and the data product, have been identified. Thus, two different business models have been considered.

The important factors to address when developing a business model for a connected product is; to digitize the original product and company, establish a data security system, choose a technology for the product's data transmission, position the product in the value chain and make sure to establish a feasible solution to manage data transfer costs.

Looking at the business model for data sharing as a product within a connected business ecosystem, the important factors are to; make sure to understand the customers' true needs, acquire IT and ICT expertise, strive towards the establishment of a data sharing platform and a mutual technology standard. Finally, the establishment of a data security system is vital for the data product's business model as well.

Key words: Data sharing, Internet of Things, connectivity, connected products, Networked Society, automotive ecosystem, connected business ecosystems, business models, Business Model Canvas.

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June 2, 2015

Emma Sandin Andrea Tollstadius

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1 Introduction

In this chapter, the topics of data sharing and connected products, as well as Ericsson, who proposed the topic of this study, are introduced. Thereafter, the study's background, problem definition and purpose are presented. Finally, an illustration of the report structure is presented, in order to aid the future reading.

1.1 Background

Today, your mobile phone has more computer power than NASA had when they put the first people on the moon in 1969, according to Hollingworth & Hoffman (2012a). There are around seven billion mobile phones in the world today, which enable fantastic new ways of communicating (Sanou, 2014). In 2012, Hans Vestberg, the CEO of Ericsson, estimated that there would be 50 billion connected devices in the world by the year 2020. These devices will not only be mobile phones but also tablets, watches, cars, houses, etcetera. It is not the devices as such that are interesting, but how industries and societies can benefit from the emerging possibilities that connectivity brings, including data sharing from connected devices. This is what Ericsson calls The Networked Society (Ericsson, 2013a).

Connectivity is defined as the Internet connectivity, or in other words the Internet access. This is the connection to the Internet infrastructure that enables computers and devices to use Internet services, through, for example, mobile network, Wi-Fi or broadband (Wikipedia, 2015a). The Internet of Things (IoT) is the interconnection of uniquely identifiable embedded computing devices within the Internet (Höller et al, 2014). The IoT within an industry, connecting products and services throughout the value chain and with each other, has several contemporary definitions. While Ericsson refers to the phenomenon as the "Networked Society", other actors chose a terminology closer to the industry. Accenture calls it the "Industrial Internet of Things", defining it as the network of physical objects, systems, platforms and applications with embedded technology to communicate and share information with each other (Daugherty et al, 2014). McKinsey & Company and Boston Consulting Group instead refer to it as the "Industry 4.0", defining it as the new digital industrial technology transforming sensors, machines, workpieces, and IT systems connected along the value chain, beyond a single enterprise (Nanry et al, 2015; Rüssmann et at, 2015). Cisco, Intel, General Electrics, AT&T and IBM refer to it as the "Industrial Internet" (Industrial Internet Consortium, 2014).

However, this is not a new phenomenon. In van Dijk's book *The Networked Society* from 1991, the author concludes that the society is in the process of becoming a networked society. Van Dijk (1991) argues that with the expanding IT network, people will become more dependent on the IT infrastructure, both socially and as individuals. The book predicts that companies and organizations will be able to use this new connectivity to communicate and bring large amount of information into the company (van Dijk, 1991). These predictions align with the report *How Digitalization Drives Productivity and Competitiveness in Sweden* by Growth Analysis, the Swedish

agency for growth policy analysis (Report 2014:13). The report concludes that the Information and Communications Technology (ICT) sector has been driving productivity growth since 1995. Further on, the report concludes there is a large growth potential of productivity due to digitalization within the whole private sector, which it is not yet fully realized.

The next generation digital technology could add up to 14.2 trillion US dollars to the global economy, mainly affecting the gross domestic product (GDP) of mature economies (Daugherty & Berthon, 2015). The GDP in Germany alone will increase by one percent per year due to digital technology within industries over the next ten years (Rüssmann et al, 2015). As argued by distinguished management consulting firms such as McKinsey & Company, Boston Consulting Group and Accenture, the connected industry and society is here to stay (Daugherty & Berthon, 2015; Nanry et al, 2015; Rüssmann et al, 2015). Or as the MIT Technology Review (2015) summed up the topics discussed during the Consumer Electronics Show in January 2015; "it is the Internet of Just About Everything".

The past decade, policy makers, corporations and organizations have explored the possibilities of how the IoT can be beneficial in industries. For example, research has been conducted regarding the demands for successful connected Intelligent Transport Systems (ITS) implementation (Sternberg & Andersson, 2012; Sternberg & Andersson, 2014). Another area where data sharing and connectivity are researched is within supply chains (Grean & Shaw, 2002; Thiesse & Condea, 2009). Grean and Shaw (2002) identify the benefits of supply chain data sharing as an improvement of both business-to-business and business-to-consumer relationships. Thiesse and Condea (2009) point at the benefits of RFID (radio-frequency identification) technology in networks connecting supply chain actors. Another area where the implementation of IoT has been studied is for monitoring in homes. An article in *IEEE Sensors Journal* concludes that a network of sensors is to thank for the successful implementation of IoT for monitoring in domestic home environment (Kelly et al, 2013).

An industry where IoT is applicable is the automotive industry. Car manufactures use connectivity to, among other things, make the cars safer. For example, by integrating an emergency call function, through which the car automatically call the emergency center if it is involved in an accident (European Commission, 2015). Car manufacturers can also create better user experience for their customer with innovative infotainment systems. Volkswagen incorporates major smartphone operating systems into the infotainment system, Rolls-Royce links the customers' iPhone's to the car to provide a wider range of innovative entertainment, and Volvo Cars uses the mobile network to improve infotainment system and create safer cars (Volkswagen, 2015; Rolls-Royce, 2015; Volvo Cars, 2015a). The electric car manufacturer Tesla Motors can even update their cars' software wirelessly over the Internet (Tesla Motors, 2015). New unconventional automobile actors, such as software companies, are also using the connectivity to enter the market. Apple are rumored to be experimenting with connected vehicles and Google are testing

autonomous cars, stating that they will have a car on the market in 2020 (Bloomberg, 2015).

A business ecosystem, or industrial ecosystem, is a system where the involved actors use each others waste material as resources (Korhonen, 2001). In a connected business ecosystem that refers to the data created by one actor, that can be of use for another. Korhonen (2001) makes the allegory to the natural ecosystem, which is a circulating system based on the recycling of material. Other similarities to the nature are the utilization of local resources, the diversity of involved actors and the gradual development of the system's diversity, which all are commonly recurring parts of connected business ecosystems (Korhonen, 2001). Ericsson describes a connected business ecosystem as a new way for connected actors to create new business opportunities by collaborating, receiving and sharing information (Ericsson, 2013b).

Within business ecosystems, there is a need to decide how to utilize the business opportunities. This can be done using a business model. There are several definitions of what a business model is. According to Chesbrough and Rosenbloom (2002) a business model provides a coherent framework, that uses the technological potentials and characteristics as inputs, and through the customers and the market converts them into economic output. Osterwalder and Pigneur (2010) say "a business model describes the rationale for how an organization creates, delivers and captures value". They have also developed the Business Model Canvas, a well-known tool recognized to be comprehensive and relevant when building a business model (Osterwalder & Pigneur, 2010).

1.2 Ericsson

Telefonaktiebolaget L M Ericsson (Ericsson) started out as a telegraph repair shop in 1876 by Lars Magnus Ericsson in Stockholm, Sweden. This was the same year as Alexander Graham Bell applied for a patent for the new invention the telephone. Not long after, Lars Magnus Ericsson designed his first telephone. Since then, Ericsson has grown through industries and geographical areas. Through history, Ericsson's products have changed from landline telephones to mobile phones, and from handsets to network technology. Simultaneously, the geographical market has emerged from Stockholm in the 19th century to almost the entire world in the 21st century. (Centre of Business History, 2015)

Today, Ericsson is known for software and hardware solutions within the telecommunication industry. However, Ericsson has recently established a new business line called Industry and Society (I&S) that develops solutions for industries beyond telecommunication. Solutions and technology originally developed to target the telecommunication industry, fit very well and can be re-used to support other industries, connecting their business and ecosystem. Ericsson I&S currently focuses on five industries; Automotive, ITS, Shipping, Utilities and Public Safety. The task of I&S is to offer Ericsson's technological solutions to actors within the industry and public sector, with the purpose of adding value to the industry's core products and

services. This includes solutions such as smart grids within utilities, connected vessels and connected automobiles, to mention a few.

At the moment, the automotive industry is becoming connected. A car nowadays collects a lot of data from its surroundings. The car can, for example, measure the temperature, how slippery the road is, its own location and how close it is to other objects. This data can be relevant for the original equipment manufacturer (OEM). Moreover, it can be of interest for other actors in the automotive business ecosystem. Examples are insurance companies, automobile repair shops, traffic authorities, GPS-developers, etcetera. Information about the slippery roads or accidents could be used to issue road warnings to other drivers, preventing accidents. (Wallin, 2015)

Ericsson is already involved in cooperations with actors regarding facilitating connected solutions in the automotive industry, and they are eager to learn more about this new, fast-developing industry landscape. In the future, actors will have the ability to collect more data than ever before. As the world moves towards 50 billion connected devices, the possibilities of data sharing seem endless. The automotive business ecosystem, in collaboration with Ericsson, will be used as a case study in this master thesis.

1.3 Problem Definition

Connectivity, data sharing and IoT, are topics frequently discussed within society, corporations, governmental institutions and authorities across the world today. All prestigious consulting firms and the world's largest software developers are continuously publishing new articles on the subject. Inevitably, buzzwords such as "IoT", "Industry 4.0" and "Industrial Internet" are on the contemporary management agenda.

Since the early 1990's, the visions and potentials of integrating the IoT within industries have evolved. However, there are few successful implementations to be found. Around the world, the utilization of sharing data, and how businesses can benefit from their connected products, are being discussed. Further more, questions regarding how governments and institutions should support the development, and what obstacles businesses and societies will face when trying to get there, are also being discussed. The viewpoints from different actors and industries must be compared and combined, in order for the networked society to reach its full potential.

In order to understand the potential business opportunities for actors within connected business ecosystems, this master thesis aims to illuminate what is most important to consider when building a business model for data sharing within a connected business ecosystem. To do so, this master thesis will investigate the industry trends of data sharing, studying the actors and potential actors of a connected automotive business ecosystem.

1.4 Purpose

The purpose of this master thesis is to identify important factors to consider when developing business models for data sharing within connected business ecosystems.

1.5 Delimitations

The consumers' views and feelings upon data sharing are outside the scope of this research. Therefore, primary research in the shape of interviewing consumers and end-users has not been conducted. However, being stakeholders in data sharing, the consumers will be regarded in the study from the companies' and organizations' perspectives.

1.6 Acronyms

CTC - Connected Traffic Cloud
CVC - Connected Vehicle Cloud
DPA - The Swedish Data Protection Authority (Datainspektionen)
EU - European Union
GPS - Global Positioning System
ICT - Information and Communications Technology
IoT - Internet of Things
IT - Information Technology
ITS - Intelligent Transport System
I&S - The Industry and Society Unit at Ericsson
OEM - Original Equipment Manufacturer
R&D - Research and Development
STA - The Swedish Transport Administration (Trafikverket)
UBI - Usage-Based Insurance

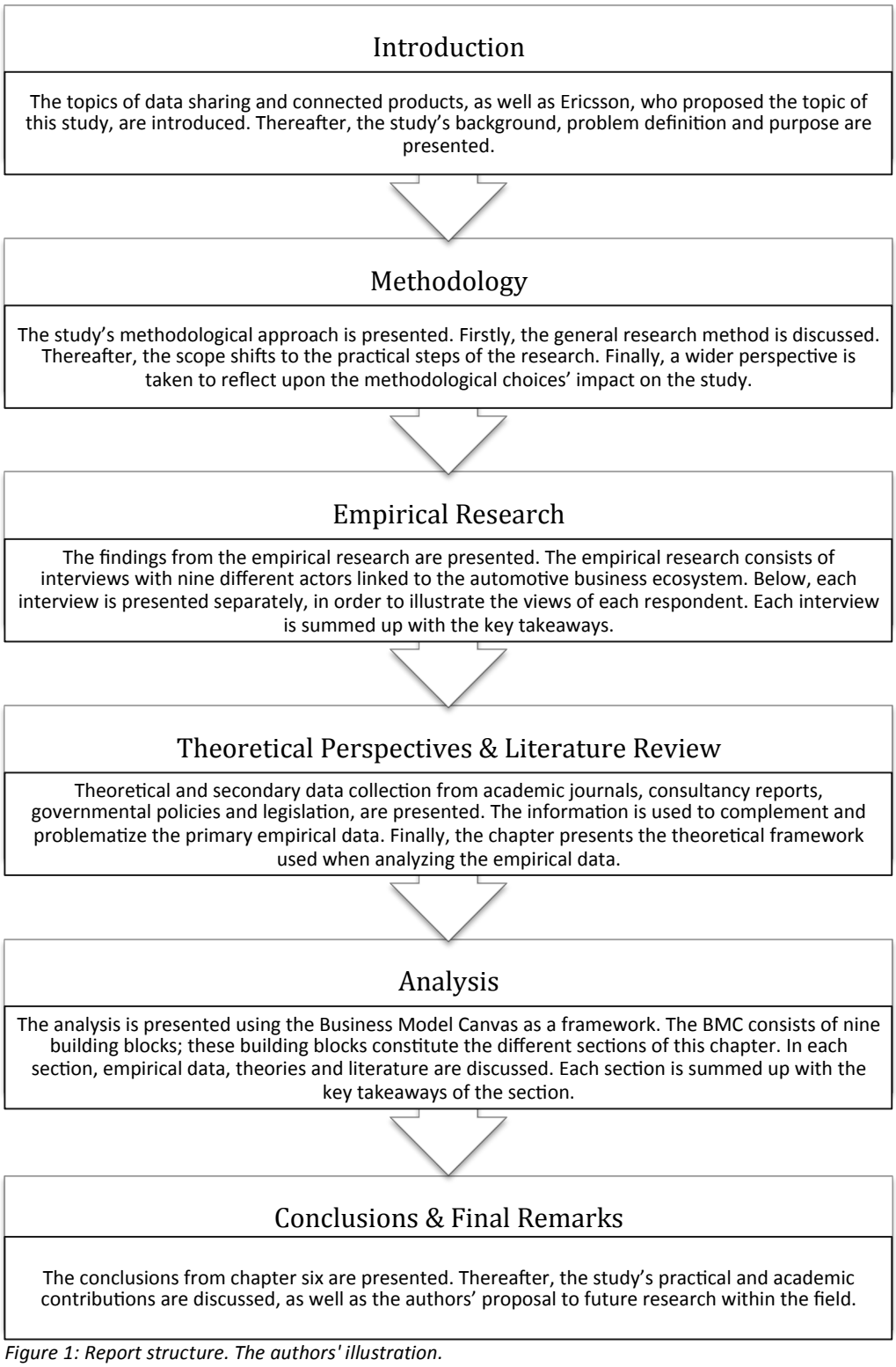

Figure 1: Report structure. The authors' illustration.

2 Methodology

In this chapter, the study's methodological approach is presented. Firstly, a wider perspective of the entire research method is discussed. Secondly, the chapter is scoped down to the practical steps of the research, including considerations of empirical research, collection of literature and theories and the analysis. Finally, a wider perspective is taken to reflect upon the methodological choices' impact on the study.

2.1 Selection of Research Method

This master thesis was conducted using a qualitative research method. This means that the focus in the analysis has been on the implications of the thoughts and views of the respondents, rather than quantifying collected data (Bryman & Bell, 2011). This study emphasizes the respondents' views and thoughts upon data sharing and connected products. Hence, it is vital to capture how the reality is perceived by the respondents (Bryman & Bell, 2011). The qualitative research method allowed a flexible approach, where an inductive research strategy emerged. This means that mainly, the study has focused on the empirical findings, and theoretical considerations have derived with the empirical material in mind. Therefore, this study is not based on a hypothesis, but rather a willingness to investigate a contemporary question. Initial secondary data collection in the shape of research contributions within the field of data sharing and connected products was gathered to prepare the authors for the empirical research. Consequently, this study has an inductive approach with an abductive touch.

2.2 Epistemological and Ontological Considerations

This study has its roots in the comprehension of data sharing within a specific business ecosystem, and how the actors within this ecosystem perceive it. Therefore, the epistemological direction of the study is of an interpretive nature. This means that the understanding of data sharing within the researched business ecosystem, i.e. the automotive ecosystem, should be best understood by those who are involved in this type of social action (Bryman & Bell, 2011). Moreover, the study aimed at answering what factors to consider when constructing a business model for data sharing within a connected business ecosystem. As the answer to this purpose has been derived from the understanding of actors within the researched business ecosystem, the ontological standpoint was based on constructionism. In this study, the potential business opportunities between actors are of a constructive nature. This means that a business opportunity or a business model exist because of social actors agreeing upon its existence (Bryman & Bell, 2011). The chosen analysis framework Business Model Canvas (BMC) is constructed by Osterwalder & Pigneur (2010). Even though the BMC is constructed on a foundation of knowledge that business researchers across the world agree upon, it is still a truth within a group of people, rather than an objective truth (Bryman & Bell, 2011).

2.3 Research Process Structure

In order to answer the purpose, this master thesis research process was structured in five different research steps. First, basic knowledge about data sharing, connectivity and connected products and services in the industry was researched. The second part consisted of empirical primary data collection through semi-structured interviews. These were held with existing and potential connected actors within the automotive business ecosystem, and actors with knowledge about the connectivity subject and the connected society. The third part included a research within the field of business administration, in order to find a suitable business model framework. Lastly, a fourth part of the study included a more thorough review of literature, theories and other secondary data, as an addition to the initial literature review. Simultaneously, a fifth research, within the governmental actions of data sharing, was conducted. Why and how this has been executed is presented below.

2.3.1 Introductory Connectivity and Data Sharing Research

In order for the authors to grasp the subject of data sharing and connectivity, these areas was initially researched. The research of the subject was also conducted in order to prepare the authors for the empirical primary data collection. In order to provide an understanding of the technology behind data sharing and connectivity, articles and academic textbooks about connectivity and data sharing technology were also researched. By researching material such as YouTube-videos, news articles and consultancy reports, the authors were given a solid foundation to stand on in order to find relevant actors to interview. It also provided an understanding of the basics of the contemporary connectivity in industries and particularly in the automotive industry. Ericsson was a helpful actor in this stage, guiding the authors in this new field.

2.3.2 Existing and Potential Connected Actors

In order to find the factors to address when building a business model for data sharing, understanding the wants, needs and concerns of the actors within the business ecosystem is vital. One actor cannot simply look to itself since the business opportunity involve several stakeholders within the ecosystem. The chosen respondents are all actors, or potential actors, in the connected automotive business ecosystem. The aim of this study was that the collection of the respondents' collective thoughts, knowledge and experiences would form a greater whole, than the sum of its parts. Interviews (one or several per actor) were conducted with nine companies, authorities and administrations, primarily linked to the automotive business ecosystems or the connected society.

The following companies and organizations were interviewed:

- Ericsson
- Volvo Cars
- Scania
- An Aftermarket Actor
- If Skadeförsäkringar
- Mediamobile
- The Swedish Transport Administration (STA)
- Stokab
- The Swedish Data Protection Authority (DPA)

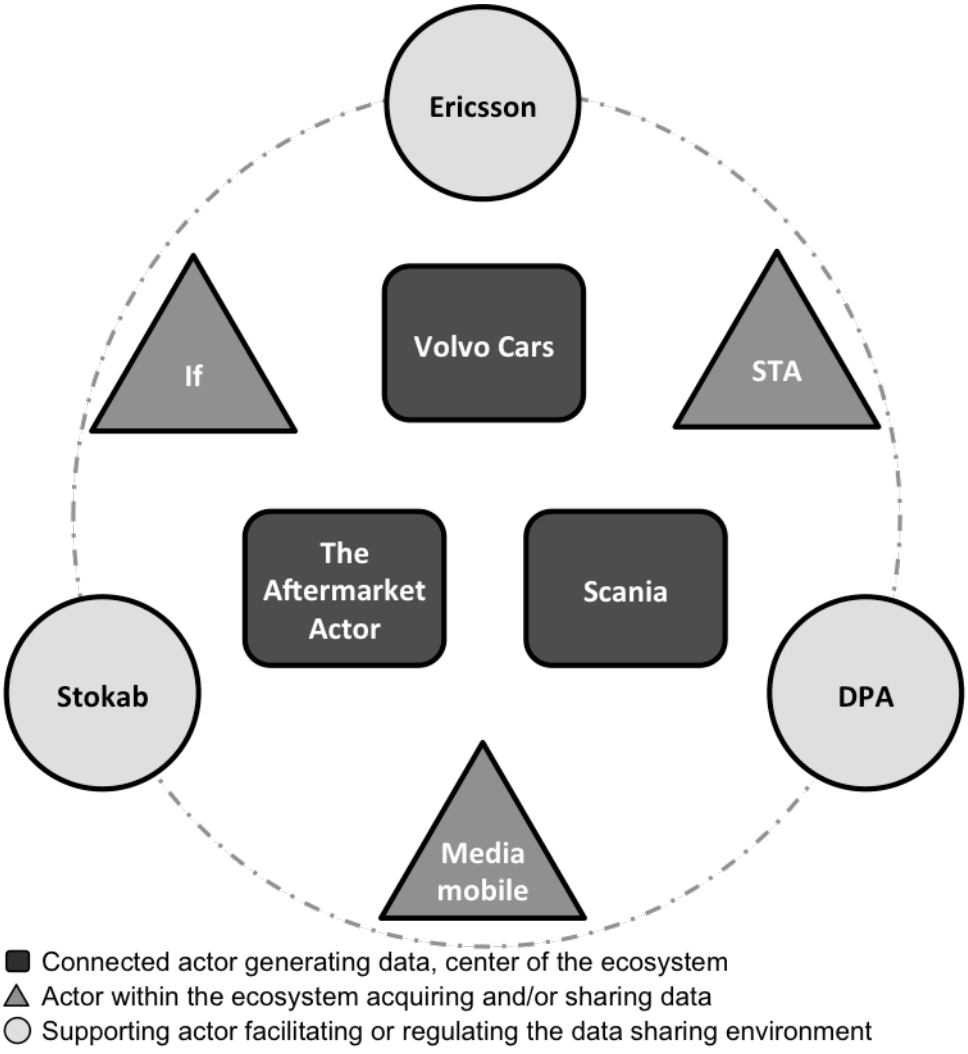

Figure 2: An illustration of the interviewed ecosystem actors. The authors' illustration.

Actors were primarily selected to give a broad insight in companies and organizations within the connected automotive business ecosystem (see figure 2). The companies and public sector actors to interview were selected according to the so-called snowball sample (Bryman & Bell, 2011). Suggestions were initially made by Ericsson. From that, the initial research led the authors to new respondents. Further, respondents suggested additional actors to interview, and the ongoing theoretical and secondary data research simultaneously led the authors to additional respondents. Suggestions of interviewees at companies and organizations were based on title and responsibilities, as well as the authors' connections. Further presentation of the respondents is presented below in section 2.5 Selection of Respondents.

Some of the consequences of a snowball sample is that suggested respondents may potentially already have a similar view upon the subject. This could possibly be the case of Ericsson and Volvo Cars, since Volvo Cars is a client of the Ericsson cloud technology. However, the authors have purposely chosen actors not involved in the Ericsson and Volvo Cars collaboration, like the Aftermarket Actor and Scania. Furthermore, suggestions of additional respondents was given by Stokab, which was interviewed as an actor to understand ICT from a local governmental perspective, thus not influenced by the automotive business ecosystem.

2.3.3 Research of Analysis Framework

The purpose of this study was to identify factors to consider when constructing a business model for data sharing. Therefore, the authors decided there was a need for a business model framework in order to make sure vital parts of a business model were considered when executing theoretical and empirical research. Subsequently, research within the academic field of business and strategy was conducted. In Osterwalder & Pigneur's book *Business Model Generation* (2010), the Business Model Canvas (BMC) framework was found and chosen to use as a tool to structure the analysis. The BMC was chosen over other frameworks, because the authors consider it to be an intuitive framework, with a broad set of perspectives of a business model. This aided an exhaustive approach of the analysis. Moreover, the BMC allows the user to exercise some liberty on how to assess the framework, which made it a good selection to organize and interpret this study's empirical material and to compare it to the literature and theories. The application of the BMC will be discussed later on in this chapter.

It is of importance to note that the interviews within the empirical research was not conducted according to the BMC topics, in order to not narrow down the respondents or to make the interviews too force-fit. Consequently, this may have caused some of the subjects within the BMC to be left out by the respondents, while they possibly would have addressed them if they were asked. However, the authors made the decision that a more loose structure would generate more honest and exhaustive answers.

2.3.4 Research of Theories, Literature and Governmental Initiatives

After conducting the primary empirical research, theories and literature were further researched. This second round of theories and literature research was conducted with the empirical data in mind, according to an inductive research strategy (Bryman & Bell, 2011). For the study to be up-to-date and exhaustive, theoretical and empirical secondary researches were executed in the contemporary field of data sharing, connectivity and the IoT. Furthermore, in order to understand the public sector and legislator's views upon data sharing, this area was also researched. This was primarily done on a national Swedish level, but European Union (EU) and international legislation have been considered, to some extent, as well.

Secondary theoretical and empirical materials were collected through well-known consultancy firm reports, academic journals, connected actors own reports and other media. A criterion for this research was that the material needed to be up-to-date, preferably published within the last couple of years, since the topics related to connected industry and IoT are continuously explored. Another criterion was that literature and theories needed to come from reliable sources, i.e. well-known and distinguished publications and organizations. To ensure the sources reliability, articles with the most citations were prioritized. By researching the Swedish governmental institutions and public administrations and authorities, greater knowledge about governmental initiatives was established. This part of the research had a somewhat abductive approach, as it commenced while public sector actors were interviewed. However, it was useful to broaden the insights from interviews with public sector actors. Advice from the Digitalization Commission within the Ministry of Enterprise and Innovation, lead the authors to new public actors in new areas to interview.

2.4 Selection of Respondents

The interviews with the actors within the automotive business ecosystem constitute the core of this study. The actors were chosen because of their involvement in the automotive business ecosystem, or to give a wider understanding of the connected society. The respondents are all either involved in; the automotive industry, a company connected to the automotive industry, the connectivity and data sharing business or a governmental actor linked to the automotive industry or the connectivity business.

2.4.1 Ericsson

During the research, meetings and interviews took place with Ericsson employees, which provided insights and complemented the empirical research. Most of the Ericsson meeting were not structured as interviews, since the goal was to get an overall view of the work that Ericsson does regarding the connectivity business in the automotive industry. The focus was primarily on the cloud based platform solutions they provide within the automotive business ecosystem. However, Per-Henrik Nielsen and Geoff Hollingworth were interviewed in the same way as the external

respondents. The reason for this, is stated in their presentations below. The employees involved in this study are presented below, stating their contribution.

Staffan Wallin
Staffan Wallin has been the supervisor for this study at Ericsson and he is the Head of Automotive within the I&S business line. He is the assignment requestor and has provided and facilitated the contact with most of the other employees at Ericsson, as well as some of the external actors. This makes him a key stakeholder at Ericsson.

Edvard Brinck
Edvard Brinck is Global Offering Lead at the I&S business line working with the Connected Vehicle Cloud (CVC). Together with Staffan Wallin, is he a part of the I&S Automotive business line, involved in the cooperation with Volvo Cars. Brinck, with his central role in the CVC offering at Ericsson, has been a key stakeholder at Ericsson, and the deputy supervisor at Ericsson.

Per-Henrik Nielsen
Per-Henrik Nielsen is the Global Head of Sales & Commercial Management for the I&S business line. He has been relevant for this study because of his understanding of the industry and insights of the business models at Ericsson. Nielsen was interview primarily to gain further insights in topic of connected industries, from Ericsson's perspective. This, because primary and secondary data about Ericsson and their offer already had been gathered throughout the research process.

Geoff Hollingworth
Geoff Hollingworth is the Head of Product Marketing for Ericsson Cloud. He is the author of several Ericsson white papers about cloud technology and safety regarding data sharing. His insights in the Networked Society, the cloud and cybersecurity have been valuable for this study. Hollingworth was chosen because of his expertise in cybersecurity, rather than the fact that he is an Ericsson employee.

Stefan Myhrberg
Stefan Myhrberg is Global Offering Lead at the I&S business line working with the Connected Traffic Cloud (CTC). He works with ITS and the potential cooperation with the STA, wherefore his insights on these subjects, have been valuable to this study.

2.4.2 Volvo Cars

Carl Hellered and David Green, Erik Israelsson
Volvo Cars is a large OEM of middle segment automobiles. The company was chosen because of its existing collaboration with Ericsson, to give an OEM's point of view of the connected car and data sharing. Three people were interviewed at two different occasions. Carl Hellered was chosen for the first occasion since he works with developing services for the connected car. He involved the market development director David Green, who also participated in the interview. On the second occasion, the project leader at the connected safety department at Volvo Cars, Erik Israelsson,

was interviewed. He was referred to through Ericsson because of his involvement in the Ericsson and Volvo Cars collaboration on the Connected Vehicle Cloud.

2.4.3 Scania

Anders Veen Huis
Scania is a Swedish OEM of trucks and busses and was chosen because of its work with connectivity and connected services for the customers. Anders Veen Huis is a former employee at Ericsson and was referred to by Ericsson. He works as Senior Connectivity Advisor at the Garage department at Scania Connectivity Lab in Munich, a part of Volkswagen Group. Anders has a substantial knowledge in connected products and connectivity, and was of great aid to the study in order to understand the industry perspectives on the topic.

2.4.4 The Aftermarket Actor

The Business Developer
The Aftermarket Actor is an automotive repair shop and spare parts provider. The Aftermarket Actor was chosen to provide insights as a possible data sharing actor in an automotive business ecosystem. The Business Developer was suggested as an interviewee by the Chief Marketing Officer at the Aftermarket Actor. The OEMs are major competitors to actors on the aftermarket, which also makes Volvo Cars' aftersales services a competitor to the aftermarket. However, the Aftermarket Actor was purposely chosen to gain another view on data sharing in the automotive industry. The Aftermarket Actor has chosen to be anonymous in this study.

2.4.5 If Skadeförsäkringar

Vilhelm Luttemo
If Skadeförsäkringar is a Nordic insurance company. They were chosen because of their work with Usage-Based Insurance (UBI) for car insurance. They ran a pilot project with a smartphone application called SafeDrive, where drivers could measure different variables connected to their driving style. If the driver wanted to, he could choose to share this data with If Skadeförsäkringar and receive an estimate of a possible discount on his car insurance premium. Vilhem Luttemo works as a Business Developer at the Product & Price department, and he was in charge of the SafeDrive project. There are other actors within the insurance industry that might not share the same views. However, If Skadeförsäkringar was chosen since they are the leading actor on the Swedish car insurance market, and because they provide brand specific insurance for several major car brands.

2.4.6 Mediamobile

Petter Djerf
Mediamobile is a data processor actor that aggregates and processes traffic information from various sources. They collect historical and real time data about road networks, slippery roads, closed roads, accidents, weather conditions, etcetera. Sources are for example commercial vehicles, transport administrations and the

police. Mediamobile aggregates the data into services for different types of GPS devices, car manufacturers, media and public authorities. Petter Djerf is Sales & Key Account Director in the Scandinavian region and was introduced to the study through Ericsson. Mediamobile was chosen as an actor already involved in collecting, buying, sharing and selling data.

2.4.7 The Swedish Transport Administration

Clas Roberg and Bengt Hallstöm
The Swedish Transport Administration (STA, Trafikverket) is responsible for traffic planning and the national road network in Sweden. They have been relevant for this study because they could provide a governmental administration's opinion on data sharing within the automotive ecosystem. Clas Roberg works as an investigator and was referred to by Ericsson. He involved Bengt Hallström, an investigator with expertise in cooperative systems and big data.

2.4.8 Stokab

Anders Broberg
Stokab is a company owned by the Stockholm City Council. Stokab provides the fiber optic network in the City of Stockholm, delivering ICT solutions. Stokab provide the City of Stockholm with passive fiber infrastructure that companies and organizations can rent, with the purpose to encourage IT development and increase connectivity. Stokab was chosen to get a better understanding for the connected society, and to lift focus from the automotive industry to provide a broader picture of connectivity. Anders Broberg is the Head of Communications and has a great insight in Stokab's business and the market development related to the connected society. Stokab is only active in the City of Stockholm. To get a nationwide perspective, governmental initiatives was later researched, based on Broberg's suggestions.

2.4.9 The Swedish Data Protection Authority

Fredrik Ekman
The Swedish Data Protection Authority (DPA, Datainspektionen) is a public authority that through its supervisory activities contributes to ensure that processing of personal data does not lead to undue intrusion of individual privacy. Fredrik Ekman is an IT-security expert and has great knowledge about the practice in data processing in Sweden and the EU. The DPA was chosen as an actor to interview for the study to gain a legislative approach to the issues of connectivity and data sharing.

2.4.10 General Consequences of the Selection of Respondents

All respondents have roles and in the automotive business ecosystem. Volvo Cars, Scania, the Aftermarket Actor, If, the STA and Mediamobile, Ericsson, are all different types of ecosystem actors benefitting from each other's resources (according to the definition of a business ecosystem). Stokab is rather a potential actor in the automotive business ecosystem, but they were chosen for this study in order to gain insights beyond the automotive ecosystem. Furthermore, the DPA is an authority

facilitating the business ecosystem as a supervisor of data protection. The combination of actors has been chosen to provide various standpoints of data sharing, which will be obtained through their diversity.

Worth mentioning is that Volvo Cars, and to some extent Scania and the STA, are already involved in collaborations with Ericsson, which could result in insights that already is Ericsson is aware of. However, they are still vital for the academic purpose of this study. A consequence of the fairly comprehensive involvement of Ericsson is the risk that the authors were biased by the thoughts and opinions of Ericsson. The authors are willing to take this risk, since Ericsson's collective knowledge within the area is valuable to the study. To minimize the risk of a biased standpoint, the major part of the empirical foundation was not collected internally at Ericsson. Furthermore, the literature has been carefully selected to get an impartial viewpoint.

Finally, a thing that is worth commenting is that almost all of the respondents are middle-aged men. Since the automotive industry, and thus its ecosystem, is a male-dominant industry this homogeneity is hard to avoid. However, the study focused on the perspectives of a diverse set of interviewed actors, rather than the heterogeneity of the respondents in terms of age and gender.

2.5 Interview Methodology

The conducted interviews had a semi-structured format where the respondents were able to talk about the subject of data sharing and connectivity quite freely. The questions were primarily used as a reminder for the authors to ensure all the relevant areas were covered. Depending on how talkative the particular respondent was, the interview questionnaires were more or less used. In those cases where the respondent was quite talkative, the interviews diverted at some extent from the core subject. A positive effect of this was that it helped generate new thoughts for the authors, but the downside was that some areas were left untouched. In the case where something was missed, the respondent was contacted per email or telephone for additional supplement.

2.5.1 Interview Questions

The interview questions were based on the initial research conducted on the subjects of data sharing and connectivity. The questions were structurally similar in all interviews, but were somewhat customized to suit the respective respondent, depending on if the actor was already involved in data sharing, potentially an actor or a public sector actor. The format of the questions was also developed as the interviews went by to adapt to the vocabulary used by the respondents. The questions were divided into three main areas; technology, business opportunities and security. They in turn were divided in the timescale of today, in the short and long term and the utopian future. As mentioned, the questions were not developed with the BMC as a specific foundation, which in hindsight could have given more direct answers. On the other hand, that choice could have limited the respondents thought processes and

important viewpoints could have been missed. The interview questionnaires can be found in Appendix 1.

2.6 Selection of Theories and Literature

As a result of the inductive research strategy, the main theories and literature research derived from the primary empirical data collection (Bryman & Bell, 2011). However, already in the study's initial phase, literature was gathered to understand the contemporary field and data sharing and connectivity. This literature was later screened according to the insights of the empirical research. A more exhaustive and theoretical research was conducted after the empirical material was collected. In the research of literature and theoretical perspectives, the following databases and sources were used: Ericsson's internal reports and material on the product offering within cloud computing, Ericsson reports and white papers, major consultancy firms own publications (McKinsey Quarterly, BCG Perspectives, Accenture, Capgemini, etcetera), previous studies from Lund University available through Lund University Publications (LUP), books found in the Lund University Catalog (Lovisa) and academic articles furthermost found through the search engine Google Scholar. Governmental views were researched through the websites of ministries, administrations and authorities, where directives, legislations and agendas were found.

In this study, Wikipedia has been used as a source when describing some technology terms. The authors are aware of the concerns regarding the reliability of Wikipedia, due to the fact is a open crowd-sourced source. However, Wikipedia has been recommended by a supervisor at Lund University, who considered it to be an adequate source when referencing technology terms. Wikipedia has only been used to provide initial knowledge for a reader who is not familiar with the technology used in connected vehicles.

2.7 Methodology of the Analysis

In this study, the Business Model Canvas framework was used as an analysis tool in order to address the important factors when building a business model for data sharing within a connected business ecosystem. The BMC framework was chosen in order to help categorize the different views and opinions brought up in the empirical data collection, and for the analysis to be exhaustive. All nine building blocks of the BMC have been taken into account when analyzing the data from the empirical and theoretical research. The building blocks were used as section headers of the analysis chapter, with the purpose to organize, discuss and compare the gathered data in a structured way. Each of the nine sections was summarized with the takeaways from the analysis of the building block. The section takeaways were later used to outdraw the conclusions of the entire study.

2.8 Reflection upon the Method Strategy

In quantitative research, reliability and validity are important criterion in order to prove the research results. Reliability defines to what extent a study can be repeated with the same result. In qualitative research, it is next to impossible to achieve reliability since social environments are constantly changing (Bryman & Bell, 2011). Data sharing and connectivity in business ecosystem are very new phenomena, highly dependent on technology. Hence, the strength of the study lies in its validity. Internal validity in qualitative research means that there is a consistency between observations and theoretical findings (Bryman & Bell, 2011). In order to obtain internal validity in this study, the analysis consist of comparing the empirical findings about data sharing in the automotive ecosystem with thoughts on the topic in academic journals and contemporary literature. Moreover, respondent validation has been applied, where the respondents have verified all empirical material. Thereby, potential misinterpretations in the empirical data collection have been avoided. External validity, refers to the extent a study could be generalized to another context (Bryman & Bell, 2011). Since this study focus on the thoughts and views of a specific set of actors within a specific business ecosystem, the empirical findings are hard to generalize in terms of practical details and facts originating from the automotive business ecosystem. Instead, the ability to generalize this study lies in the application of the BMC. The conclusions regarding the factors to consider when building a business model between actors will be generalizable across other connected business ecosystems.

3 Empirical Research

In this chapter, the findings from the empirical research are presented. The empirical research consists of interviews with nine different actors linked to the automotive business ecosystem. Below, each interview is presented separately, in order to illustrate the views of each respondent. Each interview is summed up with the key takeaways. The empirical findings will be analyzed in chapter 5. Analysis.

3.1 Ericsson

Ericsson I&S is a front-end sales and marketing business line. I&S works across all of Ericsson's business units in its offerings, as a cross-functional business line. I&S is divided into the industry practices; Safety, Utilities, Shipping, ITS and Automotive. As an actor in the automotive business ecosystem, Ericsson I&S offers the cloud based platform solutions Connected Vehicle Cloud (CVC) and Connected Traffic Cloud (CTC). The CVC is a platform developed by Ericsson that enables the car to connect to a cloud service through the mobile Internet network. Cloud computing technology and the mobile network are briefly described in Appendix 2. This makes it possible for the car manufacturer to connect and receive and send information to the car and the driver. This service is operating and is the technology behind Volvo Cars' infotainment system Sensus (Brinck, 2015). Myhrberg (2015) explains that CTC is a new concept, launched at the Mobile World Congress in the beginning of 2015, but not yet on the market. The CTC is a cloud-based platform developed by Ericsson, and an extension to the Ericsson CVC. Through the CTC, connected vehicles will be able to connect to road authorities, in order to share and receive information about traffic situations and road conditions. Because the vehicle is constantly connected and can supply real-time data, road authorities can assimilate the information and in turn inform all connected drivers about congestion and alert road working entrepreneurs about the road conditions (Myhrberg, 2015).

Interview with Per-Henrik Nielsen
Per-Henrik Nielsen is the Global Head of Sales and Commercial Management within Ericsson I&S, responsible for the front line sales within Ericsson's ten regions worldwide. He has been with Ericsson since the early 2000's, on positions around the world. Nielsen explains that about ten years ago, people in organizations wanted IT to be a separate department, dealing with IT only. Today, companies have understood that IT and ICT need to be a part of the core business. A lot of companies are trying to do this themselves, but it is complex and demands infrastructure. Hence, they often fail. Ericsson can provide the infrastructure and grids, for example within the utilities and automotive industries, Nielsen says. However, he says, it is important to understand that I&S's offerings are not only about connected cars and smart utility grids in the wealthy parts of the world. In for example Bangladesh, it could concern connected services to find clean water.

A lot of industries are changing or have been changed quite recently due to the development of connectivity technology. Nielsen exemplifies with the music industry.

The Internet enabled downloading and sharing music between people. Instead of accepting that this was a new environment to compete in, the music industry fought downloading, doing their uttermost to maintain its illegal status, and save their old business models. They did not see what Spotify saw, and therefore, the music production companies were not the founders of streaming services. Nielsen explains it is all about finding new business opportunities and business models before it is too late.

Talking about the automotive industry, Nielsen admits a lot is pointing towards car-as-a-service[1] solutions sometime in the future. However, he does not believe this necessarily will mean that the automotive manufacturers sell fewer cars. Car-as-a-service will result in people sharing the same car, since it will be used more often on a daily basis. Thus, the car will need to be replaced sooner than if it were only used by one person. Furthermore, 50 percent of the visitors in Ericsson's showroom at the Mobile World Congress in Barcelona in March 2015, were actors from industries other than telecommunications, a lot of them from the automotive industry. Nielsen says that the industry actors know that the future is all about connectivity. Hence, what is on the agenda right now is to locate the necessary assets, business models and risks, and to prioritize between the three. Nielsen says that for actors, the legal aspects of data sharing are the most crucial to address right now.

Talking about infrastructure, Nielsen exemplifies with the industrialization during the 20th century, when the car, television and refrigerator was introduced to the public. During about 50 years, the infrastructure was built before these innovations were able to reach the vast majority of people. Today, there is a belief that the connected product will be the next big thing within 20 to 30 years. However, just like during the 20th century, the infrastructure needs to be in place first. In order for the innovation to be realized, Nielsen believes Public-Private Partnership[2] is one solution that could facilitate the development. Companies can do a lot, but they cannot do everything by themselves, Nielsen says.

Key takeaways

- IT and ICT need to be a part of a company's core business.
- Companies need to find new business opportunities and business models as the industry landscape is changing.
- The legal aspects of data sharing are the most crucial to address right now.

Interview with Geoff Hollingworth

Geoff Hollingworth is a cloud specialist at Ericsson with a specific interest in the security on the Internet. He explains that with the rising of the Networked Society, every connected actor must protect its data from security breach and from being

[1] On-demand access to cars based on a subscription, instead of owning a car.

[2] Refers to a partnership involving one public and one or several private actors. The partnerships are specific types of procurement, where a public authority assigns a private actor to provide a public service or project.

compromised. He says that actors must be prepared to be hacked, simply because it is inevitable. Data hackers are, or will be, able to get through advanced firewalls. Hence, it is more important to focus on discovering the breach immediately when it happens, rather that taking extreme measures to prevent it. Hollingworth compares it to a house: "the walls do not matter if someone can walk in through the front door with a key". Therefore, he promotes a new way of shortening the time between a data compromise and the discovery of the breach. Today, the average time between the compromise and the discovery of the breach is 205 days, and this should be seconds. What he wants a system where the data is "signed". This means that data entries (when the data is created) are signed with a personal signature that cannot be changed afterwards. He compares it to the concept of bitcoins, which uses an encryption to connect the coin to a certain person (bitcoin.se, 2015). The idea is that the user would sign the data at the entry, and when it reaches the receiver, it can be compared to the originally signed data. If it differs from the original signed data, the receiver would immediately know that the data has been compromised. When backtracking the data route, the person responsible for the compromise could be found fairly easy. Hollingworth means that this approach would not directly prevent breaches, but perhaps indirectly. Furthermore, since it will enable discovery closer in time to when a breach occurred, it will be easier to find the person responsible. This will hopefully discourage people from compromising data.

Key takeaways

- It is not a question about if a company will have a security breach, but when it will happen.
- A company needs to establish routines in order to discover data compromises quickly, rather than to focus on keeping hackers out.

3.2 Volvo Cars

Volvo Cars, or Volvo Personvagnar AB, was founded in Gothenburg, Sweden. The first car was produced in 1927 (Volvo Cars, 2015b). Volvo Cars' core values are safety, quality and environment, and the focus is on making people's lives easier, safer and better (Volvo Cars, 2015c). Volvo Cars' automobiles are equipped with Sensus, a connected infotainment system and the smartphone application Volvo On Call, where the customer can monitor her car from a smartphone.

Interview with David Green and Carl Hellered

David Green is Market Development Director, focusing on understanding how the connected market will develop. Carl Hellered works with developing services for the connected car at Volvo Cars. Their mission at Volvo Cars is to develop services for the connected car where, among other things, data sharing is included.

Volvo Cars' customers are primarily the consumers, or end-users, of automobiles. When it comes to connected services for the car, they are used as a feature to enhance the car. There are two types of connected services offered by Volvo Cars today. The first is the infotainment system Sensus, which is used inside the car while driving it. It

focuses on the needs of the driver and the connected features that she might want. The second is the Volvo On Call smartphone application, which can communicate with the car from a distance, in order to send information to, or receive information from, the car. For example, the driver can start the heater from a distance, in order to heat up the inside air before a drive. The Volvo On Call smartphone application is usually included in the offer when buying a car, and then charged on a subscription basis. Hellered explains that depending on the offer, the subscription is free for the customer for six months up to three years, after that the customer is charged on a monthly basis. The Sensus infotainment system is part of the Connected Vehicle Cloud, CVC, developed by Ericsson and Volvo Cars. Volvo Cars want to develop this rapidly to create value to their customers. Hellered says that only by connecting the cars, Volvo Cars could start building services with the data that the cars are already generating. He says that Volvo Cars must work faster; he wants the development process to be quicker than the lifecycle of the car. Hellered compares the automotive industry to the smartphone industry. Both the Volvo V70 and the iPhone were launched in 2007. Since then, a lot has happened in the smartphone industry, while the automotive industry has not changed at a similar rate.

Volvo Cars do not want to develop a data sharing platform for automotive ecosystem actors all by themselves. Green says that the primary task of the actors in the automotive industry is to build the cars. The most problematic part of developing a data sharing platform is to manage to integrate different automotive actors and the functionalities of their cars. Instead, the actors in the automotive industry are turning their heads toward software actors such as Apple and Google, as they could be potential developers of this kind of platform. Green calls it a “waiting game” and it slows down the development. Since Volvo Cars want to create value and safer cars for their customers right now, they are working on connected solutions for their own automobiles only. Hellered says that if you as a car manufacturer do not work on connectivity right now, others will and you will have to pay for it later.

On the topic of Volvo Cars’ competitors, Greens says that all premium automotive companies work on connected services. Volvo Cars have an advantage in creating connected services since they have a large market share on the Swedish automotive market. 70 percent of Volvo cars sold in Sweden today are connected. However, Hellered estimates that Volvo Cars has about a five percent market share worldwide. Being a quite small actor globally, Volvo Cars cannot launch the new connected service on all markets, as they can do in Sweden today. Green says it would be great if “the four equals”, as he calls them, Mercedes, BMW, Audi and Volvo Cars, could share data between each other. The challenges in that kind of cooperation would, among other things, be to decide what data to share, why sharing it and identify its the competitive advantage. Further on, questions such as who should lead the cooperation and who should be in charge need to be decided among to actors. Despite the challenges, this kind of collaboration may come in place since it proposes a value to the customers. Receiving, for example, slippery road data from another actor is something Volvo Cars would like, since it can help improve the road safety. However, finding a kind of connectivity standard from within the industry would be

challenging. The OEMs look to the national governments and the EU, or another OEM to take the lead, so that they can follow. Alternatively, that a new player, like Google or Apple, would enter the market and build the platform.

Green says that Volvo Cars sees enormous opportunities for connected services, in terms of satisfying the customer regarding safety and services. Predictive analytics could, for example, automate the service booking based on how the car is used. This way, parts could be replaced before they wear out. This would not only be beneficial for the customer, in terms of saved time and money, but also for Volvo Cars, since it would create an ecosystem where they exist in cooperation with the customer.

Hellered says it is important to understand that the connected car enable two different business opportunities; firstly, as mentioned, it enhances the core offering; the car. Secondly, by sharing the collected data with other actors, new businesses and revenue streams can be created. Potential customers could be insurance companies, map developers and weather institutes, who could use Volvo Cars' data to enhance their products. Today, one customer of Volvo Cars' collected data is the Norwegian Public Roads Administration, and Volvo Cars also has a close collaboration with the Swedish Transport Administration. Green says that another problem with sharing data is to do so across country borders, and this aspect is slowing down Volvo Cars more than anything else.

The main cost for the connected features is the hardware needed in the cars and the development and maintenance of the software. Hellered and Green talk about focusing on creating business of the new connected services around the car. However, they say the general agenda of Volvo Cars is to sell more cars, spare parts and equipment, which are their primary revenue streams. The connected services provide extra value to the car, which in one sense make it more attractive. However, it is up to the customers to choose if they want to share data, for benefit that they see, Green says.

Safety is one of Volvo Cars' core values and it also applies to the digital plane. To protect the data from a security breach, Volvo Cars take the necessary measures. Green says that media is overdramatizing the threat of a security breach, and it is very hard for a third party to digitally enter the car while it is moving.

Key takeaways

- Volvo Cars must develop connected services faster, in order to create value for their customer.
- There is a need for a platform where automotive actors can share their data.
- The OEMs are waiting for someone (another OEM or software company) to take the lead in platform development.
- Connectivity enhances the core product and generates a new business opportunity in sharing data with other actors.
- Volvo Cars' core business is, and will continue to be, to sell cars.

Interview with Erik Israelsson
Erik Israelsson is a project leader for Connected Safety at Volvo Cars. He works at the development department for Active Safety and Chassis. He is also involved in the collaboration with Ericsson regarding the CVC. Active Safety is a system built on radar, cameras and laser which can help the driver avoid accidents and even perform automatic braking. Connected Safety is the utilization of the mobile network and the cars connected features, in order to make the cars even safer.

Volvo Cars uses cloud technology as a tool to collect, store and distribute data from and to the cars. Some of the players in the industry, including Volvo Cars, experiment with a standard for Wi-Fi car-to-car communication called ITS 5G or IEEE 802.11p (Wikipedia, 2015e). Wi-Fi technology is described in Appendix 2. Israelsson says that Active Safety at Volvo Cars currently considers it to be easier to share the data between cars using the cloud, because it requires less standardization work. However, the main driver for their focus on cloud-based solutions, is a shorter time-to-market, not because it is easy. Volvo Cars considers other major automobile manufacturers as potential partners to share certain data with. According to Israelsson, they rather partner with an actor with an existing cloud that they can connect to their own. He also says it is more important to introduce the services to their customers quick, in order to create value and safety, rather than to wait for a potential partner.

Regarding what Israelsson thinks about a platform for data sharing, he says that it would probably be easier if a car manufacturer were to create a platform, which the other OEMs could utilize, rather than if a software company were to create one. Furthermore, it might be easier for Volvo Cars to introduce a platform themselves, since they would not have to become dependent on other actors. However, he says a third party like Ericsson could gather data from other parts of the ecosystem, like the traffic infrastructure. He believes it could create an ecosystem of services connected to the car, for examples roadwork information and road conditions.

Speaking about a potential business model, Israelsson says that there is not one perfect solution. He divides it into two cases; the first being where similar actors trade data in exchange for other corresponding data, and the second being where actors sell data to other actors for monetary compensation. The gain of the connected services are primarily not monetary, rather a help to maintain Volvo Cars' leadership in vehicle safety. It is a way to build their brand and it contributes to their vision of road safety. Israelsson sees great benefit in sharing data on equal terms without financial transactions. It has an attractive simplicity since it avoids the pricing problem. Israelsson points out that there is an imbalance between different automobile manufacturers in terms of size. Volvo Cars is a relatively small actor globally, Israelsson's argument is that large actors may have a lot of connected vehicles, but since the data inflow from smaller actors will multiply when shared and used, it will still generate a high level of benefit for the larger fleet.

Finally, Israelsson explains that a success factor for the service Connected Safety is that Volvo Cars have allowed themselves to develop it cross-functional with no

limitations in their organizational structure. They have had a flexible dynamic between colleagues with the right skills, a willingness to make quick results in a prestigeless cooperation, and courage to take on new challenges without a straightforward plan, Israelsson explains.

Key takeaways

- Trading data for other data would be a preferable way to go around the pricing problem of data.
- Volvo Cars' primary motivation for connected features is to enhance their value offering in vehicle safety.
- Cross-functional teams have been a success factor when developing connectivity solutions.

3.3 Scania

Maskinfabriksaktiebolaget Scania started out as a bicycle manufacturer, founded in 1900 in Malmö, Sweden. They soon started to build trucks, and in 1911 Scania merged with a railway carriers manufacturer called Vagnfabriksaktiebolaget (shortened to Vabis) in Södertälje, Sweden. Together they manufacture trucks, busses and cars to be able to meet the growing demand in Europe. In 1969 Scania-Vabis merges with the Swedish aircraft and car manufacturer Saab and became Saab-Scania. In 1995, Scania became an independent company once again, but was bought by Volkswagen in 2008 and is now a part of the Volkswagen Group. (Scania, 2015)

Interview with Anders Veen Huis

Anders Veen Huis is a Senior Connectivity Advisor on the project "the Garage" at Scania in Germany. It is an incubator department with collaborating divisions with the aim to deliver new ideas every 14th day. Veen Huis is responsible for testing prototypes for software and hardware. The vehicle industry typically has development cycles of five to seven years, but Veen Huis considers more agile processes to be necessary. Veen Huis says that long lead times are no longer sustainable in the automotive industry. Scania's core business is still "refining iron[3]", as Veen Huis puts it. However, today's business has other requirements.

A term often used when dealing with business models is time-to-market. However, according to Veen Huis, Scania would rather work with the term time-to-value, meaning to focus on the value creation. He says that everything should go ten times as quick as it does today, in order to not be overtaken by the competition. Anything but first place is not an option. As Veen Huis puts it; "Either you are Armstrong or you do not exist", referring to the fact that almost everyone worldwide knows who Neil Armstrong, the first man to set his foot on the moon, is but very few know the name of the man who was a few seconds behind him.

[3] The authors' remark: building trucks and busses.

Scania's primary customer segment is transportation carrier actors buying trucks and busses with connected services. Potential customers for the collected data outside that segment are governmental authorities, for example the Swedish Transport Administration. In Germany, Scania is collaborating with the German Transport Administration, where they work on developing smart parking lots for truckers on highways. The parking lots are connected and can send the approaching trucks information about the availability of parking spots. This way, the drivers can avoid an unnecessary and time-consuming detour. At the moment, Scania is testing pilot projects and Veen Huis hopes it will be available on the market soon.

The connected service for the truckers is a fleet portal where driving behavior is monitored. When first introduced, its primary focus was to help the R&D department develop the trucks. Nowadays, it is also available for fleet companies and drivers in order to keep track of, for example, fuel consumption and driving behavior. The technology used today is based on a SIM-card in the vehicle. The SIM-card sends information through the telecommunication operators 3G network. The operators want to charge Scania on the same basis they charge individual mobile phone users. Veen Huis believes that this business model might be problematic in the future, as the IoT is spreading. He believes that for example Ericsson has the technology and network infrastructure to develop a better way to transfer data traffic. Thus, make the OEMs independent of the telecommunication network operators.

The primary business for Scania is to sell the original products, the trucks and busses. However, if aftersales and services associated with the trucks are desirable and value adding, the total sales could increase. The data that Scania sells to transportation and road administrations is not a primary revenue stream. However, it can help to carry the R&D costs for the connected services for the original product. Veen Huis argues that there is another way of looking at data. He talks about data as the "currency of tomorrow". Veen Huis says that many companies gather all data they possibly can today, in order to be prepared for the future. Partially because the cost of storing data is low. If Scania was to share data with competing OEMs, Veen Huis says that they would like the same kind and amount of data in exchange. If they for example share data from a certain fleet from three countries, they would like to know how the competitors perform in the same regions.

When talking about the business case for connected vehicles, Veen Huis is not comparing Scania to other OEMs, but rather to software companies like Google or Apple. Apple for example does not manufacture hardware; they have external suppliers for that. Veen Huis explains that one future scenario is that Scania is unable to handle the data and becomes a hardware supplier of trucks to software companies, who will be the key actors providing the core service; transportation. Consequently, Scania would move down in the supply chain, and that is not desirable. Veen Huis stresses the importance of knowing where in the supply chain you are and where you want to be. The higher up you are, the greater the chance of influence. However, Scania's core business is not in danger unless someone starts 3D-printing trucks, Veen Huis says.

Veen Huis considers a data sharing platform provided by an external actor to be a great idea. This platform could include a mutual standard on how the OEMs were to share their data. However, from a company perspective, there is classified data that preferably should be kept in-house, in order to stay competitive and improve the products over the competitors'. Veen Huis says that it is vital to internally decide what to share and what to keep to yourself, before starting to make deals with external actors.

Generally, Veen Huis' personal opinion is that the more data you share, the more you get access to in return. He believes that actors need to get comfortable with the idea of sharing data openly in the future, since society probably will find new ways of handling data sharing. He says that perhaps it is wishful thinking, but open data is crucial in order to be able to communicate with connected devices.

Regarding the legal aspects of data sharing, different legislations applies in different countries. From his own experience, Veen Huis says that for example, the governments in Germany and France have stricter legislations than the government in Sweden. Ownership and usage of data is normally regulated in a contract between the company and the customer. In the case where the customer is also the producer of data, Scania has stated that the data belongs to the customer. For example, a truck driver generating data about her driving behavior, owns that particular data. The agreement can also include that the one gathering the data (e.g. Scania) is entitled to use it to a certain extent. This is the praxis in the automotive industry, and Veen Huis believes it is similar in other industries.

Key takeaways

- Value creation at Scania and in the automotive industry in general needs to become faster.
- An unattractive future scenario is that OEMs become hardware suppliers of transportation services provided by software companies.
- If Scania were to share their data with other OEMs, they would like the same data in return.

3.4 The Aftermarket Actor

The Aftermarket Actor is a leading automotive spare part chain, selling spare parts and conducting aftersales services for the end-users. With a substantial market share, the Aftermarket Actor is a relevant competitor to the car manufacturers aftersales businesses. The Business Developer explains that the Aftermarket Actor is a company with an entrepreneurial spirit that likes to test new things and continuously try new projects.

Interview with the Business Developer

The core business of the Aftermarket Actor is to sell automobile spare parts. The services offered at the Aftermarket Actor repair shops are provided by the independent repair shops. Thus, they are not generating revenue streams for the

Aftermarket Actor. However, the Aftermarket Actor sees that there is a potential for connected services in cars on the roads today, since 70 percent of the cars on Swedish roads could potentially be connected using telematics. The technology of telematics is described in Appendix 2. Still, few cars have fully connected features today, and this is a type of product being developed by car manufacturers right now.

When it comes to connected features and data sharing, the Business Developer explains that the Aftermarket Actor is well aware of the automotive industry's progress within the area. To not be left behind, they have also started initiatives within this area. The connected features in cars are to a large extent affecting the aftersales market. Brand specific service and service subscriptions linked to the connectivity within the car, could potentially lock out non-brand repair and spare part actors from the market. This would be devastating for the actors on the aftermarket. To challenge the OEMs on the aftersales market, the Aftermarket Actor is developing its own technology for a "dongle", a plug-in equipment that the car owner can attach to the car in order to connect it to the company's feature. This would be an alternative to build-in services from car manufacturers. The plug-in would work in cars of all brands. Hence, ensure that the customers are connected to the Aftermarket Actor's repair shops, rather than the OEMs' own service suppliers. The Business Developer explains that they see the connected features as an opportunity to increase the inflow to their core business, the selling of spare parts.

The Business Developer believes that the key is to find an attractive offer for the customer and looking beyond the scope of driving and the car in itself. The Aftermarket Actor is trying to find out what connected services should be included to attract the customers. For example, aiding the driver by finding restaurants, hotels and gas stations automatically, or making it possible to deliver dry cleaning straight to the car. Hence, this opens up for new business partnership opportunities. Most households have several cars of different brands, the Aftermarket Actor wants to offer the customer the freedom of using the same type of connected tool to several cars, independent of brand. By choosing a plug-in from an aftermarket actor, the customer would not be locked to the OEMs' aftersales services. The Business Developer explains the OEMs begin to charge their customers for the connected services after a few years. Market analysis shows that a lot of customers choose to not renew the subscriptions. The Business Developer is convinced that basic connected service must be free of charge for the customer, but they could potentially charge for premium services. This is the business case the Aftermarket Actor is looking for.

The Business Developer says the future connected services of the Aftermarket Actor is partially a chance of a new business, being able to establish new partnerships or to share data. Furthermost, the development of connected services is a necessary action to not lose customers, as car manufacturers are building connected services and locking in the whole aftersales market.

Talking about future connected platforms and partnerships, the Business Developer explains that the Aftermarket Actor has been in touch with different actors related to

the connected automotive industry. However, the Aftermarket Actor is not primarily in contact with OEMs or other repair shops. The Business Developer believes this is a large and complex area, and that it is problematic to act alone. However, he states that the Aftermarket Actor wishes to be in control of the core product in a potential data sharing and collaboration partnership. Since the Aftermarket Actor is a service provider of a large amount of brands today, the Business Developer sees the potential of being an important actor on a platform for all cars, independent of brand or if the car was originally equipped with connected services. Further, the Business Developer does not see a future where the different OEMs agree upon one solution or one platform.

The Business Developer sees that the evolution of connectivity is taking place right now. A large driving force is the environmental aspect. A substantial part of the drivers in cities are only looking for parking spaces. "If we could aid that search, we could save the environment a little", the Business Developer concludes.

A lot of actors on the automotive industry are tiptoeing around to see what is happening next. The Business Developer thinks as soon as someone rolls out an attractive product, the market will be up and running. He adds that as always when a market is shifting or new innovations are about to happen, no one can foresee the future. The Business Developer believes that when society look back ten years from now, it did not happen the way people thought it would. Google, Amazon or Apple should not be forgotten either. He says that they are relevant when the Aftermarket Actor is analyzing potential competitors, because of their software expertise.

Security and safety are very important to the Aftermarket Actor, especially when it comes to inward communication to the cars. As soon as you are able to send commands to a car, the safety is put at risk, the Business Developer explains. Security breach in inward communication could in worst-case scenario disable brakes or take control of the car.

Key takeaways

- The Aftermarket Actor want to develop their own connected feature in order to not be locked out of the aftersales market by the OEMs.
- The Aftermarket Actor want to find a value offer that differs from the OEMs', in terms of freedom, price and usability.
- The security aspects are vital to address when developing technology for inward-bound communication to cars.

3.5 If Skadeförsäkringar

If Skadeförsäkringar (If) is the largest insurance provider in the Nordics. If was founded in 1999 by a merger of Norwegian Storebrand and Swedish Skandia Försäkringar. The history of If dates back to 1767 when a big fire made the King of Denmark-Norway pass a law, demanding real estates to have fire insurance. The

organization founded at this time was the predecessor to what some generations later came to be Storebrand and then If. (If Skadeförsäkringar, 2015)

If provides a range of different types of insurances, for example home insurance, pet insurance, travel insurance and car insurance. If is a leading player on the Swedish insurance market when it comes to car insurance, providing brand insurance for several car manufacturers. Vilhelm Luttemo is a Business Developer for Product & Price at If, and has worked with the company since the 1990's, starting at former Skandia Försäkringar. He has substantial knowledge about the insurance business and works on developing If's products and customer offerings for car insurance.

Within the insurance industry, there is a concept called Usage-Based Insurance (UBI). UBI is sometimes referred to as Pay-As-You-Drive (PAYD). UBI consists of a device tracking the drivers' driving habits, such as speed, braking, acceleration. Typically, the tracking device is built in the car. The data is then transmitted to the insurance company and the premium is re-evaluated accordingly. (Amick, 2013)

Interview with Vilhelm Luttemo
Luttemo explains that If does not use UBI for pricing its insurance premiums today. However, If has conducted several pilot projects over the past years, both with original built-in devices in the car and plug-in solutions. In 2013, a pilot project with a smartphone application was conducted. The application was called SafeDrive, and it could measure speed, acceleration, g-force and braking directly in the customer's smartphone, just by having the smartphone in the car during the drive. The driver was also able to take a picture of the trip meter before and after a drive, in order to measure the distance driven. The customers could choose to log a trip or not, by turning the smartphone application on or off. This was due to privacy reasons, if the driver did not wish to register a certain trip, the driver could simply refrain from turning on the application. When the driver had registered a certain number of trips, he would receive an estimate on a possible discount on the insurance premium. Thereafter, the driver could choose to share the data with If, which would be able to change the insurance premium accordingly. All the information was collected and shared to If through the smartphone application, where the customer was in charge of the data until she chose to share it.

The SafeDrive application was never introduced as a real product due to the fact that If prioritized other projects higher. However, Luttemo explains that UBI insurance is a topic on the agenda within the insurance industry worldwide. The concept is quite widely used in the United Kingdom, both as built-in and plug-in solutions in the vehicle, and as smartphone applications. In the Nordic countries, major insurance providers are executing different pilot projects, but no UBI products are yet on the market. Luttemo says that already in 2007-2008, the Swedish Transport Administration was trying to establish a standard for UBI insurance in Sweden. The interest among the insurance companies was, however, limited. Luttemo explains that If was further ahead on this area than other actors at the time, and therefore did not want to risk to give away knowledge to the competitors.

Luttemo explains that sometimes, large insurance providers have a hard time finding the appropriate business case and pricing model for UBI insurance. According to Luttemo, the only way to commercialize UBI insurance in order to make it attractive to customers is to reward good driving behavior and to offer discounts. Since discounts diminish the revenues, and thus the profit margin, there are limited benefits of UBI from bigger insurance actors' point of view. Instead, Luttemo believes UBI product offerings will be more suitable for smaller insurance actors who might find a niche segment. He considers the insurance market quite slow moving, wherefore these type of changes take time. In his experience, other activities than the development of connected solutions, have a tendency to be prioritized on the strategic agenda. Moreover, If's conclusion after the SafeDrive pilot project was that real-time data is not what is most important, but rather the quality of the gathered data.

If is providing brand-specific car insurance for several automobile manufacturers, among them Volvia insurance for Volvo car owners, but also brand-specific insurance for Renault, Skôda and Citröen. Talking about partnering with car manufacturers for UBI solutions, Luttemo explains that If has had collaborations with some of the car manufacturers that they provide brand-specific insurances for. However, there are a lot of questions to figure out in these kinds of partnership, Luttemo concludes. For example, who is supposed to own the value chain? Also, he adds, the trend on the insurance market, and from what he can conclude from If's competitors, is that there is a wish to develop solutions that are not built-in in the vehicles. He explains that in a future case where If were to implement UBI, they would rather build their own solutions similar to the SafeDrive smartphone application, which does not include additional partners. This, since the business model becomes more complex if more actors are engaged. Also, built-in solutions for UBI could be problematic from the insurance companies' perspectives when their customer changes car or car brand.

The general trend is that the car insurance market moves towards collecting more personal data. Traditional pricing models for the premiums are quite rough, based on information such as age and gender. It would be interesting to see how and when the vehicle is used, on what roads and how the driver is driving, Luttemo says. In case this type of information would be available to If, the entire pricing model could be more precise. Luttemo believes there is more change to come. As people in the future probably will not own their own car the same way as today, car-as-a-service and leasing will become more common. This will change the insurance market as well. As leasing becomes more popular, insurance companies will to a larger extent have to insure entire fleets rather than a particular car or driver, and this will demand completely new solutions within the insurance market, Luttemo explains.

Key takeaways

- If ran a pilot project with a UBI solution with a smartphone application in 2012. However, it was never launched as a product.
- Large insurance providers can have difficulties in finding feasible business models for UBI, since it diminishes profits.
- Luttemo considers a UBI solution not including other actors more attractive, since it makes the business models more complex.

3.6 Mediamobile

Mediamobile is a French company based in Paris, building real-time road data services for GPS-providers, car manufacturers, media services and other actors interested in road information. They merge data from all kinds of sources and can thereby provide real-time traffic services. Mediamobile is an actor already involved in data sharing, as a customer of data from various sources and a supplier of aggregated data in the shape of road information. Therefore, Mediamobile is an interesting actor, experienced in the business of data sharing. Further, they provide aggregated road data to GPS-services for Volvo Cars, which connects them to the automotive ecosystem. Petter Djerf is Sales and Key Account Director at Mediamobile Sweden. He is responsible for their business, clients and operations in Scandinavia.

Interview with Petter Djerf

Mediamobile collects all kinds of data linked to roads; Djerf categorizes these in three main types of data:

- *Speed and travel time data* - Data from commercial vehicles such as trucks and taxis. Automated GPS data from for example thousands of taxis and transportation vehicles in Sweden. Personal cars are used as well through navigation devices, aftermarket solutions and smartphones. In the near future, Mediamobile will collect GPS data directly from vehicles also when it comes to personal cars. In addition, travel time data is collected from the Swedish Transport Administration. Mediamobile collects billions of positioning data points per country per year.
- *Road weather data* - Data including slippery road detection, hazardous side wind, risk for aquaplaning, etcetera. Temperature from the road network and satellite data from available weather sources.
- *Operational data* - Information generated by humans, such as reports on accidents, traffic jams, closed roads, etcetera. Could be collected from law enforcement, public information and so on. This data is not scientifically based.

The data collected is a mixture of open access data, and data Mediamobile buys. Mediamobile works with several different partners for different business purposes (collecting data or sharing data), often subscription based. Some partners are only customers, some are both data providers and customers, and some are only data providers. Mediamobile has a collaborative business model where some services are

so called “partner deals” where an actor provides its data to Mediamobile and in return get the service as part of the payment. Data is also bought for a monetary compensation, and the processed data is sometimes sold in exchange for monetary payment. Mediamobile’s revenue streams come from customers buying their services. These are primarily car manufacturers, GPS providers, public administrations, cities, fleet management like taxis, and logistics and media services.

Mediamobile have chosen to focus on sending their information to the cars via radio technology, instead of mobile Internet networks, as some of their competitors. The different technologies are described in Appendix 2. According to Djerf, sending data over the analogue radio is most beneficial today. This, because it works even when the vehicle does not have an Internet service connection, and it is a very cheap way of transmitting data, where network operators do not need to be involved. However, it is a limited amount of data that is transferrable via radio, which will be a threat in the future, as the amounts of data shared, is continuously increasing. Djerf believes digital radio will be the solution to this. Digital radio will improve the capacity of radio-transmitted information. Moreover, radio transmission can connect to all cars at once, while Internet services have to send out the information to the vehicles one-by-one. However, digital radio is not introduced in Sweden yet. According to Djerf, the best way of transmitting data to vehicles is to send basic information via digital radio and let the drivers know more detailed information can be available if they connect to the Internet.

Talking about the business of data sharing, Djerf separates the three different activities gathering, processing and delivering. It is very important to separate these, since they involve very different actors and competencies. It is also important to understand that each activity could be conducted in various ways depending on the deliverable. The most appropriate way of transmitting the data may vary if the customer of the deliverable is a car manufacturer or media actor. There is a lot of math involved in processing data, and the right competencies are essential. Djerf mentions Google as an actor who is extremely good at this. He points out that Google might collect too much data, sometimes similar to a “big brother” phenomenon, and perhaps leading the way in a direction that society do not wish to go. However, Djerf admits that one cannot help to be impressed by Google. Djerf considers Google a key actor who drives the connected industry, when it comes to pushing more traditional companies towards data sharing and connected products.

Djerf explains that data sharing in general is a very immature market. Customers of aggregated data services do not really know what to ask for in terms of quality. For example, what is considered adequate, local data sources is not known among customers. An actor can sell a product based on its overall coverage in Europe, when it in fact has scarce sources in parts of Sweden. Further, customers seldom understand or see what is behind different sources. The amount of data points can fluctuate at times, something the customers are not aware of.

Djerf says Mediamobile's competitors are primarily Google, Inrix, Nokia and Tomtom. These four and Mediamobile are all very differentiated actors, providing similar services. All are very good at collecting data, but distribute them in different ways. Google, who is known to have a lot of free cash flow, can concentrate on innovating services that may not be profitable. The different competitors are selling a variety of maps, software and traffic information. Inrix works with transmission through the Internet, but use radio as a transmission channel in the United Kingdom as a cash cow. "One might question the fact that we use radio since the Internet is very up and coming", Djerf says. "However, a lot of people tend to unsubscribe the mobile Internet services in the car when the free subscription runs out. Therefore, radio is more effective today".

Mediamobile want to gather even more data than what they do today. Djerf sees the Ericsson Cloud as a potential partner when it comes to collecting data from personal cars. However, in order to avoid personal integrity issues, Mediamobile only collaborate with data providers who can supply anonymous data, Djerf explains. The privacy issue is a huge hurdle to overcome for the whole data sharing industry.

Djerf says the connected automotive industry is moving fast. However, he does not see that it is necessarily a good thing; he means that the industry needs to mature. Djerf explains automotive actors have different ways of handling privacy issues, normally with terms of agreement stating what data will be collected and for what purpose. For the technology part, there are some roaming[4] difficulties, due to the fact that data traffic can be very expensive, especially for cross-border transactions. Besides that, the technology for sharing data already exists, Djerf believes.

Key takeaways

- The data market is very immature and customers do not know what they want or what to ask for.
- Mediamobile uses collaborating business models, which includes different partnerships and different ways of getting paid for the data; monetary compensation or trading it for other data.
- Collecting and distributing data can be done using different technologies; Mediamobile uses the radio, since it is a inexpensive transmission channel.
- Mediamobile uses both open data and data bought from commercial actors, for the development of its product.

3.7 The Swedish Transport Administration

The Swedish Transport Administration (STA) is responsible for the long-term planning of the transport system. The STA is also in charge of the state road network and national railway network (STA, 2015). It is a relevant actor, both in relation to the automotive ecosystem, and to the existing and future data sharing. Clas Roberg

[4] When the user's device connects to a transceiver in another country and therefore has to pay an additional fee (Wikipedia, 2015f).

and Bengt Hallström are investigators at the STA's unit for Planning & Usability, focusing on ITS. Roberg works with data sharing, information systems and service development and Hallström works with cooperative systems, which is the infrastructure-to-vehicle and vehicle-to-vehicle communication within ITS.

Interview with Bengt Hallström and Clas Roberg
Since the STA is a governmental agency and not a profit-driven corporation, its viewpoint on data sharing is particularly interesting, providing a public interest perspective. The STA wants to increase safety and maintain road conditions. Hallström explains that the STA wants to collect data to provide better roads and transport systems, in order to improve their own services within road maintenance. Hallström hopes that road data will be gathered by connected personal cars in the future, since it would be more efficient. Today, the STA measures road surface once a year with certain tools and vehicles. Road surface information from cars on a real-time basis would aid the road maintenance. Another type of data collected today is travel distances and travel times. This is based on historical data from commercial transportation like trucks and taxis, but also survey and interview data. With real-time data straight from vehicles, the STA's predictions could be a lot more accurate and the process would be more efficient, Hallström and Roberg believe. Further, the traffic control office could direct the traffic more efficient if data was sent straight from cars to the STA, Roberg believes. Hallström explains data has been collected on highways outside Paris in France, where data from only two percent of the vehicles on the roads were enough to understand the traffic flows. However, he adds that these are highly travelled highways, and for most Swedish highways a much higher penetration would probably be needed. How high penetration is needed also depends on what is being measured. Roberg explains that travel times and distances need only a few data sources, whereas friction data needs a quite high amount of data sources to be reliable.

The STA has recently started a procurement of real-time data from connected taxis and traffic software developers such as Tomtom, Mediamobile and Inrix. If these kinds of actors can meet the quality standards, they could deliver data for road maintenance and traffic control. Since the STA is a customer of different data sources, it is a potential customer of data within the automotive business ecosystem. Car manufacturers and transportation actors such as Volvo Cars and Scania have the technology to collect data from their vehicles and sell to, for example, the STA. This is already being done in Norway, where Volvo Cars share data with the Norwegian Public Roads Administration. However, Hallström explains that there is a supplement (886/2013) to the EU directive (2010/40/EU) stating that actors holding traffic safety related information have to share it for external use free of charge. How this regulation is supposed to work in reality is still being discussed within the industry.

When it comes to sharing data, the STA shares data openly to the public and private actors like Google, Mediamoblie and other software companies. Hallström and Roberg explain that the STA believes that traffic related data for the operation and maintenance of roads should be free and accessible through them. If the STA

provides data originally bought from market actors for external use, it will probably be more expensive.
Hallström and Roberg explain that the STA's strategy is not to provide services that commercial actors already offer like travel time service to end-users; they consider this to be a task for commercial actors. Roberg adds that this is different in different countries; some European transport administrations want to build these kinds of services for drivers. The STA has a project called *Nordic Way* together with the transport administrations in Norway, Denmark and Finland with the aim to build a platform with the automotive and transportation industries on slippery roads and hazardous warnings. Hallström explains that the Finnish Transport Administration is the driver in this project. In Finland, further actions have been taken in order to develop connected services to the public, than it has in Sweden. As mentioned above, the STA would like the private sector to contribute with these initiatives.

Hallström and Roberg are very clear about the fact that the STA will never be interested in collecting data about individuals. The data shared with the STA must therefore be anonymous, something they demand of their data suppliers.

Key takeaways

- The company is starting to buy real-time data from connected traffic software actors, in order to enhance its core mission.
- The STA is only interested in offering unprocessed data, leaving the making of services to commercial actors.
- The STA will not collect information about individuals, only anonymous data.

3.8 Stokab

Stokab provides Information and Communications Technology (ICT) infrastructure in the Stockholm region. It is a public-service corporation owned by the City of Stockholm, and they provide a passive fiber optic network in Stockholm. Stokab was founded in 1994 as a consequence of the deregulation of the public telecommunication industry. Their purpose is to provide a fiber optic network for banks, hospitals, telecommunication operators, authorities, etcetera. The fiber network aids connectivity in the city, equipping almost every building in the city with connection. Right now, Stokab is also connecting the streets. Anders Broberg is Head of Communication at Stokab, and has long experience from the ICT industry. Before the review of the interview with Broberg, is a short introduction to ICT in society.

Information technology (IT) is "the technology involving the development, maintenance, and use of computer systems, software, and networks for the processing and distribution of data" (Merriam Webster, 2015). ICT refers to the use of computers and computers systems when collecting, storing, using and sending data (Cambridge Dictionaries Online, 2015). In order to achieve high-level quality ICT in society, the focus needs to be on leadership and governance, and less on technological investments. In order to create smart cities, there is a need for smart leaders and

governmental functions that can facilitate digital transformation for business and individuals. ICT will help cities view themselves as service providers, and enable inter-city collaborations (Ericsson, 2014b).

Interview with Anders Broberg
Broberg says that Stokab wants to provide fiber alternatives to ensure higher speed for the data traffic in the wireless networks. In order to make Stockholm a "smart city", connectivity is a key. Stokab wants to help the telecommunication operators to move their transmitters from the large base stations on the roofs to smaller ones closer to the street. Broberg says that Stokab are working on placing fiber optics in; bus stations, parking lots, public restrooms and advertising billboards. The network operators can place their base stations on these locations, closer to the users.

An initiative from the City of Stockholm within ICT is the data platform Open Data (Swedish: Öppna Data). On this platform, the different city administrations can share their data. At first, the purpose was to facilitate the internal sharing of real-time data, but as the project developed, the City of Stockholm realized that making data accessible to the citizens and the private sector could gain value for society as a whole. It is a platform in two steps, first is a filter and a converter that anonymizes the data, and second is the open platform with a user interface. Through the platform people, companies and authorities, can access data.

Broberg talks about the difficulties in coordinating the development of platform services. He says that authorities are prone to turn to private companies like Ericsson, IBM and Cisco in order to use their solutions. He also says that the technology seems to be the easiest part to develop and implement, while the legal aspects and administration are what is limiting the development. Broberg says that most often, it is a one-time investment for the organization when they are developing the service.

Key takeaways
- Smart cities will contribute to the networked society with connected public places, such as parking lots and bus stops.
- There is a need for initiatives from governments to enable commercial actors to create a connected society, for example, an open data platform.

3.9 The Data Protection Authority

The Swedish Data Protection Authority (DPA) is in charge of individuals' privacy in the information society. The DPA issues guidance and statues on data privacy, as well as carry out inspections of potential data infringements (DPA, 2015). They interpret the Personal Data Act in different topics and issues both for commercial companies as well as public authorities. Before the summary of the interview with Fredrik Ekman, a short summary about Swedish data legislation is presented in order to give the reader a basic insight before reading the interview.

Swedish Data Legislation and Protection

In Sweden, the integrity and privacy of individuals are protected by several legislations, primarily the Personal Data Act (1998:204, Swedish: Personuppgiftslagen). With personal data means any information directly or indirectly attributable to a natural person. The Personal Data Act is based on the EU directive (95/46/EC), which aim is to protect the integrity of individuals in data processing. Processing include all types of personal data handling, whether performed by a computer or not, examples include collection, registration, storage, processing, disclosure by transfer, dissemination or other provision of data and compilations or joint processing (Justitiedepartementet, 2006).

In 2012, the European Commission proposed a reform of the protection of personal data. The new proposal's purpose is to unite the national data protection legislations, and to modernize the legislation in order to protect personal data in a global world with new technologies. The reform is estimated to be approved by the end of 2015, and the new regulations to be in place in 2018. Since the reform proposes a regulation, it will automatically become law in Sweden, replacing the Data Protection Act.

Interview with Fredrik Ekman

Fredrik Ekman is an IT-security expert and his mission at the DPA is to translate the law into technology terms and what it means in practice. He has a background in the private sector where he worked as a consultant within IT-infrastructure and IT-security. His assignments include understanding the dependencies in the IT-infrastructure, and to have an overview of the technology and flow between the IT-systems.

The Personal Data Act is a subsidiary law, which means that if it contradicts another law, the other legislation will precede. When processing personal data, there is always a controller of the personal data. This is the one who collects the data, decides how to use it and what to use it for. It is not tied to ownership, only the responsibility of processing the data. If there is a third party processing the data on behalf of the controller, that party is called a processor. Ekman describes this with the example of Swedish schools using Google's App for Education where the school is the controller of the student's personal data and Google is the processor.

If a company wants to share personal data and lack legal support, they need an agreed consent from the user, granting them the right to process the user's data. This is normally handled in a terms of agreement, which the user accepts when first starting to use a service. Ekman says that in most cases, the user has not given consent to the controller to merge the data with other data from another source. If the controller has the intent of merging data from two different sources, it has to be stated in the agreement so that the user can give an active consent for the merge. A company cannot, however, put whatever they want in the agreement. In many cases, the company adds clauses about collecting more data than they need for the specific service, because "it might be usable in the future". This is not legally allowed

according to Ekman. For example, is it stated in the Personal Data Act that personal data cannot be stored indefinitely; the data controller has an obligation to weed out what is no longer needed. This is something that a company cannot override by an agreement. As Ekman puts it: “A user can never agree to bad security”.

Ekman says that with the new EU data reform, it has been proposed to introduce a penalty for companies on five percent of the total yearly turnover for treating personal data wrong. With a penalty, organizations will hopefully protect their data more properly they do than today. The DPA can see some carelessness when they perform inspections. According to the Personal Data Act, the authority has the mandate to demand the controller to stop processing data if it is misused. However, the problem is that it is a reactive solution, and that personal integrity may already have been violated. Most organizations try to do the right thing, since no one wants bad publicity. Moreover, there is no legislation in the EU forcing companies to report a data breach, neither to the concerned user nor to the public, according to Ekman. In the United States, this is regulated, and it is one of the reasons the hack attack at SONY Pictures became worldwide news in the end of 2014, where the hackers managed to get hold of a lot of personal data and leaked it to the public (The Telegraph, 2014). If a penalty was established, the obligation to report a breach will in extension be a necessity.

For international companies processing personal data, a problem may occur when they want to share it within the company, if it includes cross-border transfer. The EU’s Article 29 Data Protection Working Party has developed Binding Corporate Rules that enables corporations to be able to share the data inside the organization (Article 29 Data Protection Working Party, 2013). Ekman says that there are ways for corporations to get around these rules and share more freely, but it could result in very bad publicity that might do the company more harm than good.

When handling personal data, it is very important to know what kind of data that is dealt with. The data itself might not be of a delicate nature but in combination with other data it could become sensitive. It is also important to know what anonymous data is. Ekman explains that all data that can be traced back to a specific person is personal data. This means that an encryption is not enough to exempt the company from following the obligations in the Personal Data Act, if there is a decryption key that could be used to retrieve the original information.

Talking about open data, Ekman points out that it is easier to openly share data not concerning a person, since the same requirements for privacy do not apply. He says that the risk of getting hacked increases when systems are accessible via the Internet, and when letting other services connect to open APIs (Application Programming Interfaces). The more an organization opens up, the bigger the exposure for an attack. However, a great risk according to Ekman is a targeted attack, when someone plant harmful code inside an organization’s program. When code is manipulated in the development phase, a hacker could enter the system in a later stage. Planting harmful code inside an organization is easier than to hack a firewall, according to Ekman. One

way to limit this risk is to only give access to the employees who need to use the data. Nevertheless, it is still an important risk to regard.

Regarding cloud computing, Ekman again mentions the SONY Pictures hack attack and how severe leaks can be, and stresses the importance of having a data security mindset. There is a lot going on regarding the cloud and IoT right now. Ekman explains that there is a Code of Conduct for cloud technology with general recommendations for cloud services. It includes a best practice for cloud services, what safety requirements to meet, how to handle personal data and so on.

Key takeaways

- Consent from the user is needed in order to process personal data, however, improper handling can still lead to legal ramifications.
- It is difficult to anonymize personal data in a way that makes it untraceable to a certain person.
- Companies need adequate security systems to protect their data.

4 Theoretical Perspectives and Literature Review

This chapter presents the theoretical and secondary data collection from academic journals, consultancy reports, governmental policies and legislation. The purpose of this chapter is to get an understanding of the current research and contemporary views upon data sharing and connected products and services. The information is used to complement and problematize the primary empirical data. Finally, the chapter presents the theoretical framework used in chapter 5. Analysis, when analyzing the empirical data.

4.1 Digitalization and Connectivity in the Industry

In a world of connected physical objects communicating with each other, business models need to be adapted and reinvented. Companies need to understand how to capitalize on data and prepare a new type of workforce with new capabilities. Both the governance and financial models need to be updated. On a national level, countries need to develop infrastructure, businesses new ways of creating value and governments to find forces to bring together public, private and educational sectors (Daugherty & Berthon, 2015). In the future, successful companies will use the IoT to capture growth opportunities through boosting revenues by increasing production and creating new hybrid business models, exploit intelligent technologies to fuel innovation and transform their workforce (Daugherty et al, 2014). The new industrial technologies behind advanced production equipment (e.g. 3D-printing) and smart products (e.g. connected cars) have the ability the digitize the value chain. Using data the right way, these products could change how things are designed, manufactured and serviced around the world. A "digital thread" could connect all parts of the value chain. The ability to follow a product across its life cycle could increase the uptime in production machinery, reduce time-to-market and make it possible to understand the customer (Nanry et al, 2015).

Industries and countries will embrace the Industry 4.0 in different ways and at different times. Manufacturers have to set priorities among their production processes, identifying key areas of improvements and analyze the long-term impact on the workforce and conduct strategic planning. Manufacturing-system suppliers need to understand how they can use technology to generate higher benefits for their customers, such as networked embedded systems, automation and analytics-driven services. In order to do this, the following need to be addressed (Rüssmann et al, 2015):

- Define which business models to leverage
- Build a technology foundation
- Build the right organization
- Develop partnership that are essential in the digital world
- Participate in developing industry standards.

Digital upstarts are threatening the bottom lines, growth and business models of traditional service providers. About a decade ago, digital actors such as Amazon disrupted the retail industry, and in recent years, more and more industries are facing unexpected entries. A few examples are the taxi service Uber, car fleet Zipcar or the accommodation service AirBnb, who all in a short time expanded tremendously and claimed part of the traditional taxi, car rental and hotel industries. Even though these digital disruptions are visible all around the world, large companies rarely put the time, money and effort into transforming their services, as they do for their products (D'Emidio et al, 2014). D'Emidio et al (2014) propose that companies under threat need to:

- Focus on service innovation on a matching scale to their product R&D
- Personalize the customer experience
- Simplify and automate the ways services are delivered.

In conclusion, companies need to find more collaborative ways of working, focusing on their customers instead of internal processes. Customers' expectations are getting higher, wherefore ideas and new opportunities may lie further away than the immediate competitors. The mobile Internet and smart devices are unlocking growth opportunities and lowering barriers to entry, which has made it possible for actors such as Uber to quickly gain market share. Companies also need to further develop their big data and analytics, in order to compete with actors such as Amazon, who have the ability to utilize and make value of what used to be useless data. Finally, the IoT with smart connected products opens up possibilities for proactive, automated services. This enables new commercial models, which do not have to be structured in the traditional fee-for-service fashion (D'Emidio et al, 2014).

In their paper *Changing the game before the game changes you,* Hollingworth and Hoffman (2012a) discuss the importance of keeping up with the digitalization. They argue that companies must realize that, and how, their business will change, in some cases even in a disruptive manner. The article points out that the biggest mistake a company could make is to believe that their product is impossible to digitize and therefore could not be disrupted. Foremost, the article stresses the need for a company to know its true core business, in order to bring the business into the Networked Society. Therefore, a company also needs to transform its business organization and in extension its business models (Hollingworth & Hoffman, 2012a).

In another article by the same authors, the application as a phenomenon is named the unit of disruption. This refers to a product or service that disruptively changes how people communicate with each other (Hollingworth & Hoffman, 2012b). The application has the ability to transport and display information to, for example, smartphones, computers or cars (Hollingworth & Hoffman, 2012b).

The Internet is becoming the most essential infrastructure of the 21st century. It connects people, companies and institutions across the world, in a way that infrastructure revolutions, such as transportation and telephony, have never done

before. It is an infrastructure that billions of people think is unbreakable, but the World Economic Forum (2014a) argues the Internet infrastructure is not indestructible. They propose a set of recommendations in order to maintain and develop the delivery of digital infrastructure. These include that businesses and governments should promote growth of digital services, establish international guidelines and open doors to international digital cooperation (World Economic Forum, 2014a). Governments could have an essential impact on helping the digital infrastructure in society. For this, long-term policies and goals are needed. Governments need to understand the private sector's vital role in bringing new innovations to the market. Therefore, governments and institutions should enable new marketspaces (Bock et al, 2015). Governments should also encourage technological and business model experimentation, and remove barriers of innovation (World Economic Forum, 2014a). Governments are facing a challenge with few instructions and best practices. Thus, experimentation will be essential (Bock et al, 2015). Cooperative business models should be encouraged in order to achieve greater utilization and grow the demand for digital services. Further on, governments should modernize policies and legislation, in order to support investment across the ICT value chain (World Economic Forum, 2014a). It will be essential to capitalize on digital technologies to bring improvement to human productivity and quality of life (Bock et al, 2015).

4.2 Data Sharing and Big Data in the Industry

"Big data" is a contemporary buzzword within society, enterprises and organizations. The amount of data produced keeps increasing, and according to the Scandinavian research group SINTEF, more data has been produced the past two years, than previous in history. Research shows that by the year 2020, 1.7 megabytes of data will be produced for every person at every second. That adds up to a total of 44 zettabytes (44 trillion gigabytes) per second worldwide, compared to 4.4 zettabytes today (Bansal, 2014). Our world is changing, and is increasingly getting more dependent on insights from big data. However, it is important to understand the value of big data does not come from only the quantity. In order to capture social and business value, the data need to be of high quality. The potential of data and technology holds both promise and risk (World Economic Forum, 2013).

Ghosh (2011) argues that the faith in data is exaggerated; data has no value in itself, it is not until it is processed into information that it becomes valuable. In processing data, the protection of personal data and privacy become vital. There is a need to help individuals understand how their data is being used and its implications. The passive consent-model where individuals agree on sharing their data is not enough; new ways of engagement and control by the individual is needed. It is also argued that the context of data sharing matters, which need to be regarded and communicated (World Economic Forum, 2013). Margolis (2013) argues that if companies or organizations want to develop or start to use big data, they need to start with the customer or individual, become observers of the role data is playing in people's life. This includes identifying unmet needs, creating tools and designing the whole data experience.

McAfee and Brynjolfsson (2012) argue that using big data when managing a business is essential to gain a competitive advantage. Data-driven decisions are better decisions (McAfee & Brynjolfsson, 2012). Software companies such as Google and Amazon are masters at using data to drive their businesses, but there is nothing stopping other more traditional companies from achieving expertise in the field as well. Empirical studies show that the companies who manage to combine domain expertise with IT knowledge gain an advantage over their competitors (McAfee & Brynjolfsson, 2012).

4.3 Connectivity in the Automotive Industry

In 2014, Capgemini conducted the survey Cars Online 2014 where they interviewed 10,000 consumers, representing ten countries. As much as 79 percent out of these potential customers prefer connected services in their new cars. The high percentage implies that no matter what your customer segment is within the automotive industry, there is a demand for connected services. The survey shows trends in opportunities for OEMs and dealers in the automotive industry to create a stronger customer relationship by adding connected services. Capgemini mean that the connectivity would open up for better ways of communication with the customers, creating a stronger customer satisfaction (Capgemini, 2014). A study done by Pierre Audoin Consultants shows that automotive companies in general are turning to IT- and software companies to support their connected services (Pierre Audoin Consultants, 2015).

According to Mosquet et al (2014), there are high expectations for new cars to be connected in some way in the year of 2015. A connected car is, according to Mosquet et al (2014), a car that is connected to; the cloud, users devices, other cars, or infrastructure. With this connectivity, new services and business opportunities arises and with them the need for new business models. The research shows that consumers look for innovation when buying a new car, generally and in the terms of connectivity, fuel economy and safety. Two features that are considered innovative are active-safety and assisted-driving, features that with the help of digitalization are making the car safer by reducing the risk of human error. The technology to get there already exists; what is needed is to sort out the legal and liability concerns. In order to do this, Mosquet et al (2014) claims that the OEMs need to partner up with other OEMs, governments and regulatory agencies. With the advanced technology needed for digitalized and connected vehicles, the OEMs become more vulnerable to hacking attacks. Therefore, the security is more important when dealing with connected vehicles, than non-connected vehicles (Mosquet et al, 2014).

The World Economic Forum's and Boston Consulting Group's report *Connected World: Hyperconnected* (World Economic Forum, 2014b) discusses the transportation and way of travel in the future. Looking at future traffic management in large cities worldwide, they conclude it will need to be connected. The traffic management system Condition-based Megacity Traffic Management (COMET) is a

multi-stakeholder system that uses real-time data to manage traffic flow and public transportation system. A cost-benefit analysis applied on the COMET system is assessed in the report. It indicates that there would be a global saving of two to ten billion US dollars by the year of 2025 if connected traffic management were implemented (World Economic Forum, 2014b). The COMET system includes connectivity between the driver, the vehicle, the traffic management and authorities. As a traffic management system is implemented, private-public collaborations and data security is vital to address (World Economic Forum, 2014b).

During the first months of 2015, Bloomberg Business and the Wall Street Journal have reported that Apple and Google are about to enter the automotive industry (Bloomberg, 2015; Wall Street Journal, 2015). Google has been testing and developing an autonomous car since 2010, and in January 2015 Google stated that they will have cars on the market within five years (Bloomberg, 2015). Early in 2015, people claiming to have insight in Apple, said that Apple has hundreds of engineers working on a car that will be on the market by 2020 (Wall Street Journal, 2015). The rumors about their entrance on the automotive market are, according to Apple, only rumors. Nevertheless, automotive executives say that the threat of Apple and Google is regarded as serious competition within the automotive industry. They also believe that if Apple and Google were to enter the market, they would move very fast. The past years, the barriers of entry in the automotive industry have been lowered, for example with the entrance of the new actor Tesla, who makes electric vehicles (Bloomberg, 2015).

4.4 Political and Governmental Initiatives and Legislation Within Data Sharing

Policies on data sharing, digitalization and connectivity are topics on the political agenda on a local, national and international level. Public initiatives affect the possibilities of the private sector, which makes policy important for data sharing. Further on, governments legislate on data protection on national and international level. Complying with these legislations are vital when looking for business opportunities within data sharing. Therefore, this section will discuss Swedish policy and legislation connected to data sharing.

Swedish Governmental Policy Regarding ICT, Open Data and Digitalization
In 2011, the Swedish Government presented *ICT for Everyone - A Digital Agenda for Sweden*, a new ICT-policy including 22 areas of digitalization. The ICT-policy states that Sweden should be the best in the world at exploiting the opportunities of digitalization (N2011/342/ITP). In 2012, the Government established the Digitalization Commission within the Ministry of Enterprise and Innovation in order to monitor, analyze and track the progress of the ICT-policy goal (Dir. 2012:61). Over time, the agenda of the Digitalization Commission has developed.

In 2015 it was decided that the agenda of the commission is to (Dir. 2015:18):

- Carry out societal and industrial analysis to highlight what potentially could affect the digitalization agenda.
- Identify strategic areas to address in the development of the future digital policy.
- Investigate how the promotion of digitalization should be carried out on a national level.

The Digitalization Commission has delivered three reports in 2013, 2014 and 2015 (SOU 2013:31; SOU 2014:13; SOU 2015:28), addressing different topics on the Digital Agenda and examined the progress of the digitalization in each topic. One of the 22 topics on the Digital Agenda is Entrepreneurship and Business Development, stating that the potential of IT should be used to increase corporation's growth, competitive advantage and commerce (N2011/342/ITP). This topic engages several agencies, administrations and other non-governmental organizations (Digitalization Commission, 2015). One of them is Vinnova, the Swedish innovation agency, which has the mission to promote sustainable growth by improving the conditions for innovation (Vinnova, 2015). In 2012, Vinnova was appointed the mission to develop and maintain an open platform for data sharing, called *Öppnadata.se*. The purpose of the platform is to collect and share data of governmental agencies to entrepreneurs, corporations and organizations in order build products and services based on the data (N2012/3599/ITP).

Swedish IT and Telecom Industries (Swedish: IT&Telekombolagen) is a member organization for companies within the ICT and telecommunication sector (Swedish IT and Telecom Industries, 2015). In their report *Digitala tjänster som lyfter Sverige* (Swedish IT & Telecom Industries, 2012), they explicitly point to the need of governmental initiatives to open data sources in order for ICT and telecommunication companies to develop their services as well as for entrepreneurs to build new ones.

4.5 Innovation Through Data Sharing

In the article *New Patterns of Innovation*, Parmar et al (2014) discuss how companies can use data to drive growth. The article enumerates five patterns that can help companies create value for customers using data and analytical tools, utilizing data that the companies already have or have access to. These patterns can be used individually or together.

The first pattern is to use data that physical objects generate (or could generate) to improve a product or service, or to create new business value. Due to new innovations in technology, sensors and wireless communication make it possible for physical things of all sorts to create big data. For example can sensors that are built into machines continuously inform the user of the machine's condition, or alert about an upcoming break down. The second pattern is to digitize physical assets. One way is digitizing the product sold to the customers, as Spotify and Netflix do with music and

movies. Another way of using digitalization is to analyze and visualize the products to improve the production. The third pattern is to combine data within and across industries. With the possibilities to collect big data, industries can merge data they collect with data from other sources, in order to help coordinate information with other actors or industries. The fourth pattern is to trade data. This pattern has some similarities with the previous, but with the difference that this is more of a one-way information flow. A company can sell its data as a service to another company. However, the article points out that the lack of standards is a big challenge when sharing and combining data. The fifth and last pattern is to codify a capability. This means that if a company is extraordinary good at a certain process, they can digitize it and sell it to other companies, using cloud technology. (Parmar et al, 2014)

Finally, the article provides suggestions on how to get started on working with these patterns and the identified success factors. Apart from what they call hygiene factors (management support, adequate resources and cross-functional teams) the success factors are:

- Strong technology presence
- Input from external parties
- Motivating leadership
- Emotional commitment.

To get started, Parmar et al (2014) have stated a few questions regarding data that are useful to try to answer in order to find new business opportunities. What data do we have, what data can we get hold of, and what data can we create from our processes or products? With the answers to these questions, companies are ready to take on the five patterns. (Parmar et al, 2014)

4.6 The Competitive Landscape for Connected Products

Porter and Heppelmann (2014) apply Porter's old five forces that shape industry competition (Porter, 1979) to the industries of smart, connected products. Porter & Heppelmann (2014) argues that smart, connected products will have a transformative effect on industry structure, as they will create a new area of IT. They also predict that it will have the greatest effects on manufacturing industries.

Bargain power of buyers
As businesses become more connected, bargain power of buyers will be reduced. Connectivity enables businesses to obtain a closer relationship to the buyers since they closely can follow how products are used, and interact with the buyers in an intimate way. It also eases the process of making customized products and services and segment customers. However, connected services may also aid the customer to play one manufacturer against another and the fact that the manufacturer collect a lot of information on the customer may decrease their desire for the product (Porter & Heppelmann, 2014).

Rivalry among existing competitors
Connected products may shift the rivalry among competitors, as value-adding services will compliment the original products and make it possible to even further customize the products. High-tech products may also move the competition away from prices, as the fixed costs of R&D increase. Companies with high fixed cost will be very vulnerable to price wars, thus this may affect rivalry. New types of services may shift the offerings of the competitors, as products and services change shapes and become a part of a greater product offering. (Porter & Heppelmann, 2014)

Threat of new entrants
Porter and Heppelmann (2014) argue for both higher and lower barriers to entry a market with connected products. On one hand, barriers of entry goes up since new entrants will face high fixed cost due to R&D cost of embedded technology, product features, etcetera. Broader services and product offers may increase barriers even further, where a services is linked to a specific product. Further, first mover advantages in setting up connected products and services, may cause high switching costs for the customer. However, barriers of entry are believed to go down as new competitors are leap frogging into existing incumbents markets. The possibilities for new entrants arises if actors on the market do not view the connected and digital offerings as vital, but focuses on hardware and physical attributes on the original product. Additionally, product companies are facing competitions from actors such as Apple. (Porter & Heppelmann, 2014)

Threat of substitute products and services
Threat of substitution may go down due to more customized products with a higher customer value, causing industry growth. However, as connected products and services lead to new business models, product-as-a-service causes a substitution threat to a lot of products. Examples are shared car services and shared bike rentals, which will lower the amounts of cars and bikes sold over time, as users only have to pay for the amount of the product they use, not the products itself. (Porter & Heppelmann, 2014)

Bargain power of suppliers
Connected products will change the traditional supplier relationships and shift the bargain powers. With a new focus on the connectivity of the product, the focus will shift from hardware to software. Thus, making the hardware supplier less important, and lower its bargain power. However, from a value chain perspective, it is crucial for actors to understand their internal capabilities of connectivity. Relationships up and down the value chain will be necessary. Subsequently, new suppliers of software, connected features and analytics will emerge. These actors' bargain power will be high, as they have the ability the capture a lot of the value of the manufactured product. Suppliers of technology are also believed to have a high bargain power due to their relationship with the end customer and access to user data, e.g. Google. (Porter & Heppelmann, 2014)

4.7 Analysis Framework: the Business Model Canvas

The chosen framework for the analysis in the next chapter is built on the Business Model Canvas (BMC). The BMC is a tool developed and presented by Osterwalder and Pigneur in their book *Business Model Generation - A Handbook for Visionaries, Game Changers and Challengers* (2010). The BMC is a framework that consists of nine blocks to help a company get a structured way of building a business model (see figure 3). The nine BMC blocks cover the four main areas of business; customer, offer, infrastructure and financial viability. The blocks have two main purposes; to address the important aspects in a business model and to map the interaction between them. The BMC can be used for building, understanding, implementing or reinventing business models. The business model is a foundation on which the company can build its strategies and organize its processes. (Osterwalder & Pigneur, 2010)

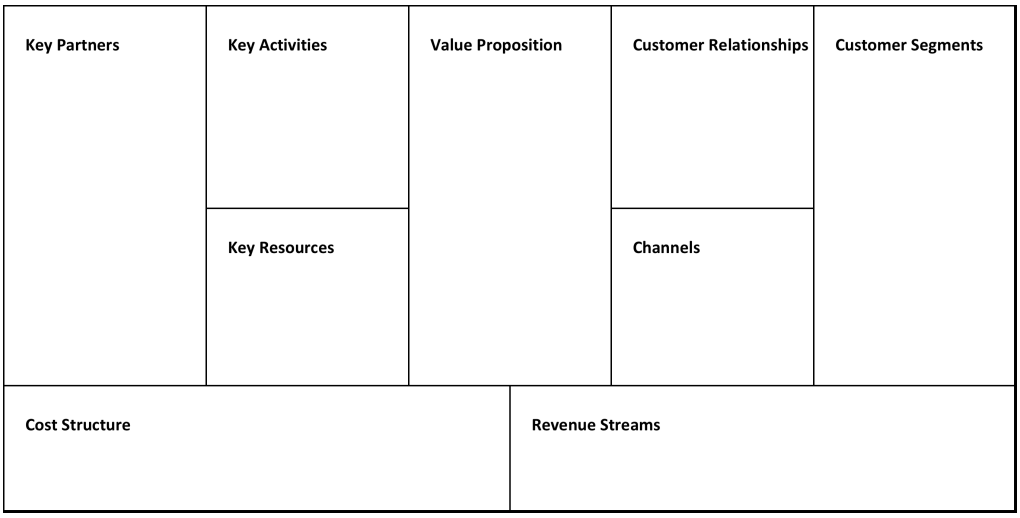

Figure 3: The Business Model Canvas. The authors' illustration, based on an illustration by Osterwalder & Pigneur (2010).

The nine blocks of the BMC are (Osterwalder & Pigneur, 2010):

Customer Segments - defines the different groups of people or organizations an enterprise aims to reach and serve. In order to better serve customers, they may be grouped into distinct segments. A business model can include one or several customer segments, but they are important to segment in order to decide which to focus on and which to ignore. Customers belong to separate segments if:

- Their need requires a specific offer
- They are reached through different channels
- They require different relationships
- They have different profitabilities
- They are willing to pay for different aspects of the offer.

Value Proposition - describes the bundle of products and services that create value for a specific customer segment. The value proposition is what satisfies a customer's need, consisting of a set of benefits that a company offers the customer. The value proposition may be innovative or similar to other market offers.

Channels - describes how a company communicates with, and reaches, its customer segments to deliver a value proposition. Channels are the interaction points with customers, such as communication, distribution and sales. Channels serve the following functions:

- Raising awareness about the products and services
- Helping customers evaluate the company's offer
- Selling the products and services
- Delivering a value proposition
- Providing customer support

Customer Relationships - describes the types of relationships a company establishes with specific customer segments. The company should clarify the type of relationship wanted with each customer segment, and they can range from personal to automated. Customer relationships are driven by:

- Customer acquisition
- Customer retention
- Boosting sales.

Revenue Streams - represents the cash a company generates from each customer segment. It is important for the company to find out for what and how much a customer is willing to pay for a product or service. Each revenue stream may have a different pricing strategy, like value-based pricing or cost-based pricing. A business model contains two types of revenue streams:

- Transaction revenues from one time customers
- Recurring revenues from ongoing payments in order to deliver a value or a customer support

Key Resources - describes the most important assets required to make a business model work. These are the resources that enable the company to create value, reach markets, maintain relationships and earn revenue. Key resources can be physical, financial, intellectual or human.

Key Activities - describes the most important things a company must do to make its business model work. These are the most important actions to take in order to create value, reach markets, maintain relationships and earn revenue. Depending on the business model and the company, the key activities may vary.

Key Partner - describes the network of suppliers and partners that make the business model work. In order to optimize a business model, reduce risk or acquire resources, partnerships and alliances may be necessary. There are four different types of relationships:

- Strategic alliances
- Coopetition (strategic alliances between competitors)
- Joint ventures
- Buyer-supplier relationships

Cost Structure - describes all costs incurred to operate a business model. In order to obtain a profitable business model, costs need to be subtracted from the revenues streams. They are primarily derived from key resources, key activities and key partnerships. Business models may be more or less cost-driven. (Osterwalder & Pigneur, 2010)

5 Analysis

In this chapter, the analysis is presented using the Business Model Canvas as a framework. The BMC consists of nine building blocks; these building blocks constitute the different sections of this chapter. In each section, empirical data, theories and literature are discussed. Each section is summed up with the key takeaways of the section. These takeaways generate the foundation of chapter 6. Conclusions and Final Remarks.

5.1 Two Products - Two Business Models

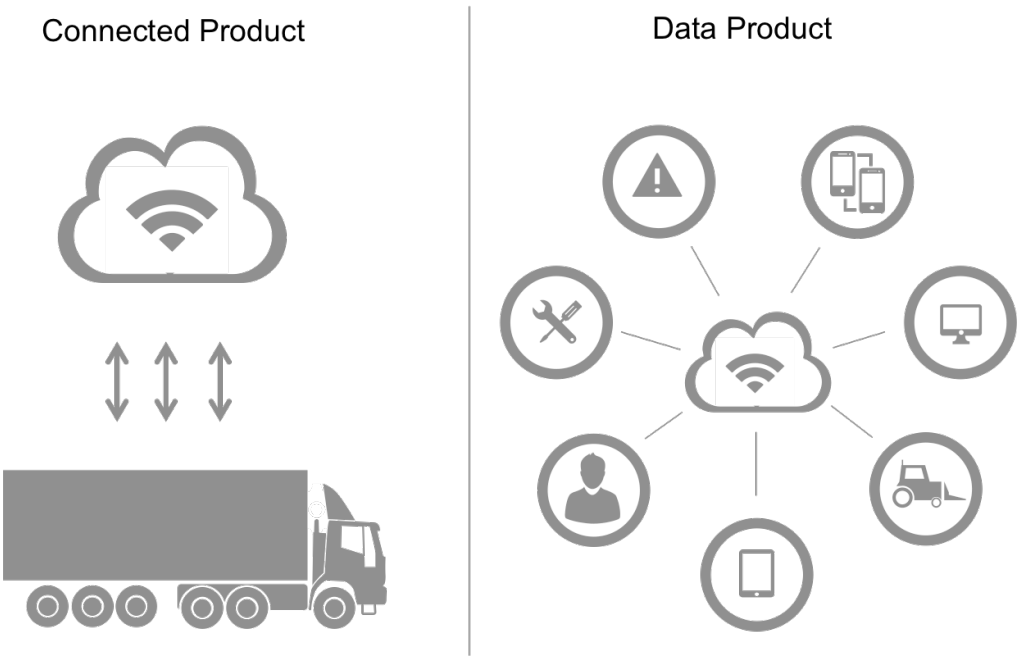

Figure 4: An illustration of the two different identified products. On the right hand side is the connected product, in this case a connected vehicle. On the left hand side is the data product. The authors' illustration.

Products including connected features, and the act of data sharing itself, generate two different offerings. Hellered at Volvo Cars, the Business Developer at the Aftermarket Actor and Veen Huis at Scania explain that data collected by their connected products can create new business opportunities, separated from the original product. The emergence of new business opportunities due to connectivity and data sharing, call for new business models (Daugherty et al, 2014; Daugherty & Berthon, 2015; Rüssmann et al, 2015; D'Emidio et al, 2014; Parmar et al, 2014). This study identifies that connected features and data sharing generate two different types of products.

On one hand, there is the connected core product, in the OEMs' case the connected vehicles, hereinafter referred to as the *connected product*. On the other hand there is the potential of sharing data generated from the core product, which forms a new product offer, hereinafter referred to as the *data product*. Throughout the analysis, the connected product and the data product, illustrated in figure 4, will be discussed separately. With these two separate products come two different customer segments, and therefore different value propositions, channels and so on. Hence, the authors conclude that actors will have to use separate business models for these two different products.

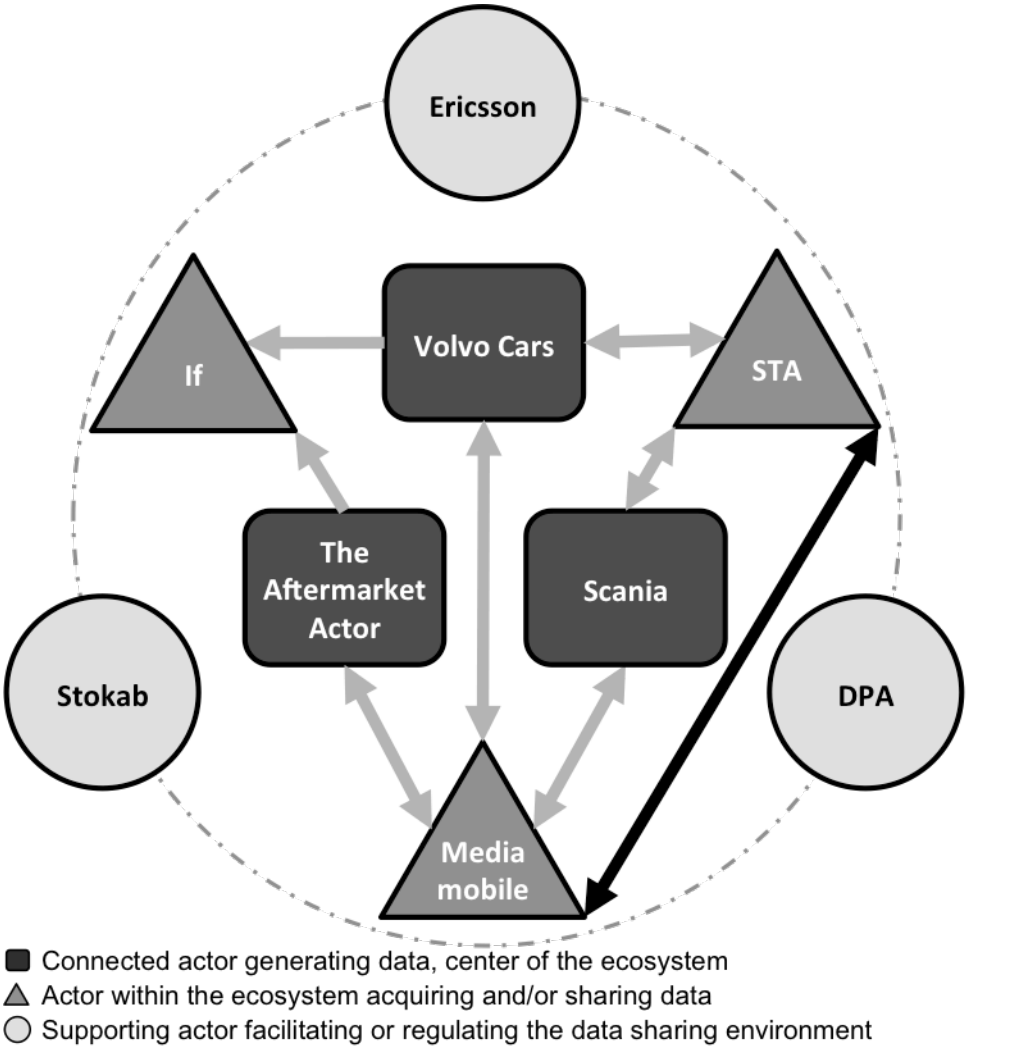

Figure 5: An illustration of the interviewed ecosystem actors and the data transactions between them. Gray arrows indicate potential one-way or two-way data transaction, and black arrows are data transactions already taking place. The authors' illustration.

5.2 Customer Segments

The customer segment of the product and its connected features, is in Volvo Cars' and Scania's cases the customer of the vehicle, in the Aftermarket Actor's case the customer of aftersales products and services, and for If the insurance subscriber. The data product however, has another customer segment; the buyers of the data that the connected products generate. This is where the data is shared between actors within the connected business ecosystem. For example, the STA is a potential customer for the road condition data generated from vehicles.

Connected Product
The respondents from Scania, Volvo Cars, the Aftermarket Actor and If point out that it is of greatest importance to satisfy and keep the customer of the core business. As the Business Developer at the Aftermarket Actor says, connected services are becoming a hygiene factor in order to retain your customers. According to Capgemini (2014) 79 percent out of 10,000 potential customers worldwide prefer connected services in their new cars. The high percentage implies that no matter what your customer segment is within the automotive industry, there is a demand for connected services. This is also shown in the research from the Boston Consulting Group, which indicates that consumers look for connectivity innovation when buying a new car (Mosquet et al, 2014).

Hollingworth and Hoffman (2012a) say that companies should concentrate on the core product. In line with this, the respondents from Volvo Cars, the Aftermarket Actor and Scania talk about their original customers as the ones they focus on. They say that connected services' primary function is to satisfy and keep existing customers, or attract new ones within the same segment. Porter and Heppelmann (2014) argue that connected products have the potential of locking-in customers, since they provide a service integrated in the product. No matter if the aim of the connected product is, as in these cases, to provide a better service to the existing segment, or to capture new customer segments, it is essential to understand what the potential customers want and what they are willing to pay for it, both in monetary and integrity terms.

Data Product
When it comes to the customers of the data product, the same rules apply; it is important to understand who the customer is, what kind of data the potential customer is interested in, how it should be packaged and how it should be transferred. In this study, the potential data customers are the connected actors within the ecosystem. The potential and existing data transactions between the actors in the ecosystem are illustrated in figure 5. The interviews have shown that these actors have different views upon each other. Volvo Cars and the Aftermarket Actor seem convinced insurance companies want to build their insurance premiums on UBI solutions from data collected by connected vehicles. However, Luttemo at If explains that is not on the agenda for them at the moment. This also applies to the STA; Volvo Cars, Scania and the Aftermarket Actor are convinced the STA wants to buy their data. However,

Hallström and Roberg at the STA explain that although they are interested in data that can make their core missions more efficient, like road maintenance, they are not interested in data needed to build new type of road services, since commercial actors could offer these services. They also explain that depending on what is being measured, the amount of sources needed for the data to be reliable, may vary. Therefore, knowing what the customer want, applies also to the quantity of the data sets.

Key takeaways

- Connected features in new vehicles are a demand from the customers' perspectives.
- It is important to fully understand the data customer's perspective when sharing data, as well as the threat of the possibility for the customer to gain the same data from someone else.

5.3 Value Proposition

Connected Product

Throughout the empirical research, it has become apparent that Volvo Cars, Scania and the Aftermarket Actor see a possibility in enhancing their offered value by developing connected products and services with the ability to collect and share data. Nielsen at Ericsson says that IT and ICT have to become a part of the core business for companies. Connecting cars and sharing data is already being done in the industry. Rüssmann et al (2015) says that a company needs to address how technology can generate value to the customer. Volvo Cars have taken this approach in order to enhance their profile as a safety provider, and the connected features that they develop include slippery road and hazardous warnings. Green at Volvo Cars considers the connected features to be a huge opportunity to increase the value in terms of safety and service to the customer. For example by providing services and repairs before the wear becomes excessive.

The Business Developer at the Aftermarket Actor explains that they are planning to offer a different value than the OEMs. They want to provide a connected solution that does not limit the customer to a specific car brand. The Business Developer explains that households with more than one car often have cars of different brands. By using a detachable plug-in, the customer would be able to transfer the plug-in to their next car, or have the same connected solution within the family. They want to offer the customers the freedom of choice, rather than to lock them in, as built-in connected features could do. Besides spare parts and repair services, the Aftermarket Actor want to include value adding features beyond the car. For example, the Business Developer explains that a large part of drivers in big cities are only looking for a parking spot, which could be aided with connected parking services. Broberg at Stokab mentions this kind of services as well. Stokab is connecting bus stops and parking lots as a part of their mission to establish a "smart city".

Data Product
When it comes to sharing data with other actors, Ekman at the DPA discusses some vital factors. All the respondents are very clear about the fact that when or if they were to share data, it would be anonymized data, or personal data specifically consented by the customer in order for the customer to receive a value. Volvo Cars' connected features primary aim is to provide an extra value to the customer, and they do not consider sharing personal data with other actors, unless the customer sees a value in it. An example is driving behavior for UBI insurance, in order to receive a personal insurance premium. As data buyers, the STA and Mediamobile both have policies stating that they only collect anonymous data. However, Ekman says that companies need to understand that anonymized data with the potential to decrypt the source, is not anonymous. Further, all data that could be derived to an individual is personal data, not only information such as name or address. Therefore, in order to comply with the Swedish legislation, it is very important for companies to know if the data they wish to share is personal data. In that case, they need to take the necessary security measures, or anonymize it in a way that ensures the data is not traceable to a person.

When looking for the value proposition for data sharing, it is also important to address what the value of the specific data set is. Ghosh (2011) argues data has no value in itself, and that it is not until it is processed into information that it becomes valuable. In the empirical research of this study, potential suppliers and customers of data have been interviewed. It becomes clear that the value of a data set may be obvious to the supplier, but perhaps not to the contemplated data customer. For example, Volvo Cars expresses a strong belief that the STA wants their data on hazardous warnings and slippery roads, exemplifying with the Norwegian Public Roads Administration, who already is a customer of this type of data. However, talking to the STA, they also explain that some of their European counterparts are more active actors in the field of providing road services, than the STA wishes to be. However, Hallström and Roberg at the STA express that real-time data regarding road conditions could be valuable in order to execute their mission more efficiently.

Key takeaways
- Overall, the interviewed ecosystem actors believe connected products and data sharing will alter and enhance their value offering.
- Data sharing and connecting products can increase the value proposition, but it is important to understand the strategic risks associated with bad publicity or legislative consequences when handling personal data.
- As a data supplier, it is important to understand what kind of data potential data customers are interested in.

5.4 Channels

When talking about connected products and data sharing, the channels are often two-way routes. The company collects data from the product or customer, in order to create a service for the customer. The data can also be shared with or sold to other

actors, for them to build services on. Additional data can also be bought from other actors to enhance the connected product or service. The authors have identified four different routes for data;

- Collection from the product or customer
- Distribution to the product or customer
- Receiving from other actors
- Sharing to other actors.

When it comes to transmitting data to connected cars, actors have the ability to choose different channels. Two different channels used for data transmitting in the automotive ecosystem today are the mobile Internet, used by Scania and Volvo Cars, and the data transmission via radio, used by Mediamobile. Today, all new cars have a built-in SIM-card, which makes it convenient to use the mobile 3G Internet to send data to the car. However, the data transfer results in fees to the telecommunication operators. Mediamobile prefers data transfer through radio transmission for this reason, since it is less expensive. The disadvantage is that a very limited amount of data can be sent over analog radio. However, radio transmission is a one-way channel. Mediamobile can only distribute information to the customers; they cannot collect information from the cars using that technology.

Connected Product
Talking about the channels between the connected product, customer and the company, several of the respondents have already, or want to, establish their own channels. They talk about the importance of being fast in creating value for their core customer. In order to introduce new services as soon as possible, Israelsson at Volvo Cars explains that developing their own solutions and distributing through Volvo Cars' own channels are the most efficient way. Further on, the Business Developer at the Aftermarket Actor believes that a channel independent of the OEMs would be beneficial for both the company and their customers. Luttemo at If talks about SafeDrive, their previous smartphone application pilot project. The SafeDrive application was an independent channel, through which If could reach their customers. According to Hollingworth and Hoffman (2012b) applications have the ability to connect networks, which makes them great channels for large-scale data distribution. With an application, companies can create a direct channel to all of their customers personally, without physical contact with the product. For example, a car manufacturer can contact the customers even if they are not in the vehicle. An example of this is the Volvo On Call smartphone application.

Data Product
The World Economic Forum (2014a) argues that governments should promote the growth of digital services and remove obstacles for technological and business model innovation experimentation. Bock et al (2015) and Daugherty and Berthon (2015) argue that countries and governments need to help the digital infrastructure in society and enable new marketplaces. Nielsen at Ericsson also stresses the importance of

establishing infrastructures before data can be shared successfully, comparing it to the infrastructures in society that was established during the 20th century.

For companies and governmental organizations, besides direct data transmission to customers, an option is to share data on an open platform. The STA, which is a public administration, believes that their collected traffic-related data from the operation and road maintenance should be free and openly available through the STA's channels. They do not want to build services on this data themselves, but encourage commercial actors to do so. The organization Swedish IT & Telecom Industries has argued open data platforms are essential for ICT and for entrepreneurs and commercial companies to develop services (Swedish IT & Telecom Industries, 2012). Some governmental initiatives for open data have been taken. For example, the Vinnova initiative of an open platform, where sources from a wide range of Swedish governmental agencies are collected and openly accessible (N2012/3599/ITP). Also, Broberg at Stokab explains that regional governments take open data initiatives as well, in order to facilitate the development of a connected society.

Key takeaways

- The respondents see an advantage in using their own channels for connected services, since it is efficient and decreases the dependency on other actors.
- Today, actors use different technologies when distributing data.
- As argued by respondents as well as in literature, governments need to facilitate the infrastructure of connectivity and data sharing.

5.5 Customer Relationships

The identified customer relationship associated to cars or insurance is typically a business-to-consumer (B2C) relationship, while the customer relationship within data sharing is a business-to-business (B2B) relationship.

Connected Product

Being a truck and bus producer, Scania's customers are road carriers and logistics companies. Volvo Cars' core customer is the buyer of the car and the Aftermarket Actor's core customer is the buyer of aftersales spare parts and services. Parmar et al (2014) and Capgemini (2014) discuss that connectivity and ICT can help customer relationships, since they open up for new ways to provide real time data and information to the customers. This is crucial in a world where billions of devices and people are connected and information is spread at a high speed.

Moreover, connected products offer a wide set of value creation opportunities, but also strategic risks (Porter & Heppelmann, 2014). New types of data may open up possibilities to a business, but a company should not underestimate the risk of security and integrity of the buyer (Porter & Heppelmann, 2014). Data sharing include security and safety aspects that cannot be ignored, something the respondents show great respect for. Ekman at the DPA explains that the Swedish Personal Data Act is strongly dependent upon consent, meaning that individuals must consent to

their personal data being used. However, World Economic Forum (2013) argues that the contemporary and quite passive consent models is not sufficient, and that customers need to take a more active role in how their data is used, which public and private actors need to work for. Ekman also explains that might not be clear to data collectors is that you cannot request for consent if the purpose of the data collection is not clearly stated. Furthermore, consent is needed if several data sets are supposed to be merged in the future. Therefore, it is important to communicate how you intend to use the data to you customer, not only in order to keep a good customer relationship, but also because it is the law. In If's case with the SafeDrive smartphone application, consent was given when the user decided to share their driving data with If. In Volvo Cars' case with the Volvo On Call smartphone application, the consent is given when the application is installed.

It is important to understand the limits in data collection and act accordingly. A mistake in data handling could be devastating in terms of bad publicity, causing great harm to the brand and customer relationship. Volvo Cars raises the concern about brand recognition and publicity. Since the main reason to develop connected services is to sell more cars, which they believe they need to act in a manner the customers appreciate. The STA touches upon the same observation; they know that the OEMs are aware of the business risk in sharing the customers' data. Margolis (2013) argues that if companies want to build services on data, they need to start with the customer or individual, become observers of the role data is playing in people's life and identify needs, create tools and design the data experience.

Data Product
The customers of data within the ecosystem are not end-users, but other actors in industries linked to the automotive ecosystem. This new customer segment requires a new type of customer relationship. Mediamobile is both a customer and supplier of data, and Djerf explains that the data sharing market is immature and still developing. Often, customers of aggregated data do not fully understand what to look for or how to evaluate if a data service is satisfying or not.

Key takeaways
- The customer relationships need to be adjusted to the customer, depending on if it is an end-user or another actor within, or linked to, the business ecosystem.
- The connected product customer relationship needs to be regarded in terms of security and safety of the customer's privacy and integrity.
- The data sharing business is still developing and data customers do not always know what they want.

5.6 Revenue Streams

Connected Product
Looking at Volvo Cars, their main revenue stream originates from selling their core product, the car. Other respondents answer in similar ways. The Aftermarket Actor's

main revenue stream is the selling of spare parts, and for Scania it is to sell trucks and busses. All these actors are convinced connected features will enable them to collect and share data with the customers. However, it is regarded as an enhancer of the core product, rather than a shift in core business. Daugherty et al (2014) argue companies need to capture the growth opportunities that the IoT generates. However, new capabilities and extra features can lead to diminishing returns due to additional costs (Porter & Heppelmann, 2014). Porter and Heppelmann (2014) argues that a company must be cautious and not add features that the customer does not want to pay for. Therefore, it is of great importance to understand what connected features are worth to the customer. Further on, Porter and Heppelmann (2014) argue connected products will increase customization, and thus reduce the focus on price competition. This will reduce the rivalry among competitors. Volvo Cars connected system Sensus and the Volvo On Call smartphone application are free of charge for the first six months up to three years. After that, the customer is charged with a subscription fee. Both the Business Developer and Djerf at Mediamobile say that studies show customers tend to unsubscribe from connected services in the car when charged for them. Since the connected features also are associated with costs in terms of fees to network operators (further discussed in the section 6.10 Cost Structure), a feasible pricing strategy is needed. While the network operators' fees need to be covered, the value offer to the customer must be worth the price charged. Otherwise, other markups need to be added in order to cover the costs. Pricing models and revenue streams are discussed in the insurance industry as well. Luttemo at If explains that the pricing models for insurance premiums today are not very sophisticated. Information such as age and gender could in the future be accompanied with data on how the vehicle is used. However, Luttemo explains that large insurance providers have difficulties finding appropriate business cases for UBI, since it has to involve some kind of premium discount in order to attract customers. Thus, causing diminishing returns.

Data Product

Even though the actors interviewed do not see data sharing as a shift in core business, they all see the potential of selling collected data as a way to generate additional revenue streams. Veen Huis at Scania calls data the "currency of tomorrow", and he says that a lot of actors gather all data they can get a hold of today, in order to use in the future. Further, he says that if Scania were to share data with other OEMs, they would like to receive the same type of data in return. Hallstöm at the STA brings up a fact that shed a different light on the additional revenue stream for OEMs when selling traffic related data. The supplement (886/2013) to the EU directive (2010/40/EU) states that actors holding traffic safety related information have to share it for external use, free of charge. However, how this is supposed to work in reality is not yet established, Hallström explains.

As an actor already involved in selling and buying data, Djerf at Mediamobile explains that there are different ways of getting paid or pay for your data; either you trade your data for other data, or you sell it towards a monetary compensation. Mediamobile uses both models, depending on the client. Israelsson at Volvo Cars talks about the advantages of sharing data and getting other data in return, since it

removes the pricing issue. However, revenue streams symbolize compensation for the value the customer is willing to pay for. Therefore, the parties in a data exchange deal still need to find a common ground on what the data is worth.

Key takeaways

- Today, revenue streams from connected services in products such as cars, are generated by charging the customers. The pricing strategy needs to be reinvented, in order to maintain the appeal of the service for the customer.
- Revenue streams from the data product could either be monetary or in the shape of data exchange.

5.7 Key Resources

Connected Product

In Parmar et al's article, the data that a company has or has access to is described as a key resource (Parmar et al, 2014). It specifically points out that it is beneficial to use data from physical objects. Both Scania and Volvo Cars have realized this, and use collected data from their customers' vehicles in order to enhance the connected services for the core customer. If an insurance company were to introduce UBI, a key resource would be adequate data to base the insurance premiums on. Luttemo at If explains that it is more important that the data is of a high quality, than being real time data. D'Emidio et al (2014) point out that big data and analytical skills are vital for companies to compete with connected products. However, the World Economic Forum (2013) points to the same thing as Luttemo, the quality is what is important, the quantity is secondary. Djerf at Mediamobile also mentions the right skills as an important resource. Data processing involves analytics and math, wherefore you need to acquire talented employees.

Another key resource is an established data security routine in order to protect your data. Hollingworth at Ericsson argues that it is not a question about if you will have a security breach, but when it will happen. Therefore, a system that immediately recognizes data compromises are more valuable than a firewall, since a firewall only helps to keep hackers out, not to protect the data once someone manage to enter the system. Ekman at the DPA talks about similar solutions. He argues that firewalls need to be complemented with access points, only giving individual employees access to the specific data they need. In a connected car, the risks of hacking are vital to address. The World Economic Forum (2014b) and Mosquet et al (2014) stress the need of addressing data security when connecting vehicles. The Business Developer at the Aftermarket Actor says that they are very careful with security of the technology solutions, when it comes to inward-bound information sent to the car. However, Israelsson at Volvo Cars says that media overdramatizes the risk of moving cars being hacked.

Data Product

The key resources for a data product is foremost the data. In the case where the company owns the platform for the data sharing, the platform can also be considered

a key resource for the data product. When the respondents talk about sharing data in the future, they express an uncertainty regarding how, and especially where, this data should be shared. World Economic Forum (2014b) in cooperation with the Boston Consulting Group, says that the future traffic will be connected. This is something that the respondents from Scania, Volvo Cars, and Aftermarket Actor all see. They talk about the possibility of sharing data between actors in the automotive ecosystem, but they do not have a clear answer about where this data will be shared. Green at Volvo Cars calls it a "waiting game" where OEMs are looking towards the other actors in the industry, waiting for someone to take the first step. He says there will be difficulties to gather and synchronize different OEMs, their car models and functionalities. Also, the automotive industry is looking at actors such as Google and Apple, waiting if they will introduce a platform for this type of data sharing. Further on, it is argued that governments need to facilitate digital infrastructure, by creating marketplaces, enable collaborations and international guidelines (Bock et al, 2015; World Economic Forum, 2014a).

Israelsson at Volvo Cars sees the advantages of OEMs creating their own platforms, since it will be faster than to partner with a software company. However, he considers a software actor such at Ericsson to be valuable in an OEM platform since they have the skills to connect other partners within the ecosystem. For the Aftermarket Actor, a platform for data sharing initiated by an OEM, is rather a threat. They see a huge risk in OEM platforms with connected features, since it could lock them out of the aftermarket. Therefore, they would like to be the center in a platform where data is shared among actors.

Additionally, another important thing to identify is the unique and valuable data for the competitive advantage. Veen Huis at Scania argues that some data need to be kept in-house in order to maintain a competitive advantage. He also says that if Scania where to share data with their competitors, they would like the same data in return in order to not lose competitive advantage.

Key takeaways

- A key resource stressed by several respondents is an adequate data security system.
- Data sharing within ecosystems require some kind of platform where data can be shared. Today, actors are uncertain of how and when this will be introduced and by whom, creating a "waiting game".
- Actors need to determine what data is essential to the competitive advantage and keep this data in-house.

5.8 Key Activities

Connected Product

Porter and Heppelmann (2014) stress that companies need to anticipate the potential competitive threats. New technologies or offers can quickly change the market, and moving slow in a high-speed environment enables new entrants to get ahead (Porter

& Heppelmann, 2014). Nielsen at Ericsson illustrates this with the example of Spotify. The music production companies were not the ones introducing streaming services, since they were too busy protecting their old business models. Actors need to be proactive and find new ways of doing business when the industry landscape changes. Porter and Heppelmann (2014) say that the threat of new entrants will rise of actors within industries do not understand that connectivity is vital, and continue to focus on the hardware. The same thing is argued by D'Emidio et al (2014), who exemplify with the taxi service Uber. The Aftermarket Actor, Scania and Volvo Cars all talk about connectivity for their core businesses. They say that they need to get started now in order stay competitive. The Aftermarket Actor considers the connected features to be a necessity in order to stay competitive on the aftersales market, and Hellered at Volvo Cars says that if they do not work on connectivity now, someone else will and they will have to pay for it later. Veen Huis at Scania stresses they same issue, comparing the importance of being a first-mover when connecting vehicles to being the first man on the moon. Today, there are rumors regarding Apple's future entrance on the automotive market, something that is dismissed as only rumors by Apple themselves (Bloomberg, 2015; Wall Street Journal, 2015). Veen Huis says that there is a potential future scenario where software actors such as Apple and Google deliver the transport services, and the OEMs become a hardware supplier for transport, a place where Scania do not wish to end up. This, Porter & Heppelmann (2014) argue, would lower the hardware producers bargaining power, since they lose power over the supply chain. Further, D'Emidio et al (2014) argue companies today do not invest in their services as they do in their products, which is interesting in a climate where a shift from product to service is viewed as a threat to OEMs. However, Djerf at Mediamobile believes Google's and similar actors' rapid growth through industries will rather encourage traditional actors to take action.

Further on, Hollingworth and Hoffman (2012a) argue that every business is digitalizationable. That means that a company's core business could be digitized, no matter what they originally produce. This would lead to outdated business models, and a need for new ones. An example of a digitized product is car-as-a-service, mentioned by Nielsen at Ericsson and Luttemo at If. Therefore, it is important for companies to review their business and key resources in order to be prepared for future digitization. However, Veen Huis at Scania says that until trucks can be 3D-printed, their main focus will be to produce trucks. Another aspect of keeping up with the development is the speed of the value creation. In the section 6.2 Customer Segments, it is concluded that connected features are desirable from a customer perspective. Scania and Volvo Cars both talk about the importance of being fast in the process of creating value for the customer, developing connected features for their vehicles. Veen Huis at Scania says that they want to move from thinking of time-to-market, to time-to-value, addressing the value their products create.

Another important aspect when connecting a product or service is to collaborate between functions and areas internally in the company. Rüssmann et al (2015) say that establishing the right organization is vital. On the contrary, D'Emidio et al (2014) state that the focus needs to be on the customers, rather than the internal processes.

This, because business opportunities and new ideas may lie further away than the immediate competitors. Israelsson at Volvo Cars explains that they work in cross-functional teams, with flexible structures and no organizational limitations, which he thinks has been a success factor in their connectivity work. Scania has a similar setting in the collaborating divisions at "the Garage", where Veen Huis works with innovation.

According to Luttemo at If, the large, established players on the insurance market will probably not be the ones to introduce UBI for car insurance. However, contrary to Porter and Heppelmann (2014), who argue actors have to look out for the threat of new entrants leapfrogging the industry, they do not seem to be concerned about this. Luttemo explains that since large insurance actors' management are down prioritizing UBI, it might be more attractive to smaller, niche actors within the field. Furthermore, actors such as Volvo Cars and Scania are huge organizations where business developers see the data sharing as the next big thing, while top management in a larger extent regard the traditional core business and other initiatives as prioritized. McAfee and Brynjolfsson (2012) argue that it is essential that the management understand the need for using data when managing a business. This is also what Parmar et al (2014) say, without management support it is hard for the R&D department to push through initiatives within data sharing, in order to drive growth.

Data Product

Several respondents talk about the ability to process data. For example, Veen Huis at Scania mentions that the company needs to be better at handling their data in order to not move backward in the supply chain. Suppliers of technology are believed to have a high bargain power due to their relationship with the end customer and access to user data, e.g. Google (Porter & Heppelmann, 2014). In line with this, the respondents mention software companies as their primary competition for the data sharing. Companies like Apple, Google, Amazon, IBM, Ericsson, Cisco etcetera, have the skills, resources and activities in place for big data processing. Contrary, McAfee & Brynjolfsson (2012) argue there is nothing that stops other companies from also achieving expertise in the data sharing field. They have the competitive advantage of knowing the industry and the ecosystem, and if they manage to combine that with IT knowledge, they have an advantage over the software companies. The question is where to put this knowledge. One alternative is to expand the IT department, another, promoted by Nielsen at Ericsson, is to incorporate IT and ICT into the core business. Of course, he encourages companies to turn to software companies like Ericsson to help them with the IT infrastructure. This might be worth considering since the infrastructure and the connection to other companies might be difficult to develop without letting it compromise the focus on the core business.

Key takeaways

- In order to stay competitive as an industry gets connected, key activities include preparing to digitize the product and get management involved in the process.
- Another activity is to attain and maintain speed in value creation, in order to stay competitive.
- In establishing data sharing, the in-house industry expertise needs to be utilized and combined with a data sharing knowledge to gain a competitive advantage.

5.9 Key Partner

A key parameter for data sharing in business ecosystems is the partners. Rüssmann et al (2015) argue that it is essential to develop partnerships in the digital world. Standards need to be developed in cooperation with the companies intended to share data among each other, something the respondents from both Scania and Volvo Cars discuss. Rüssmann et al (2015) argue that it is crucial to participate in developing industry standards to embrace the Industry 4.0. Other partnerships are established to provide a better user experience for a company's customers. D'Emidio et al (2014) claim companies need to find collaborative ways of working and focusing on their customers. This is applicable both for the development of services around the core business, but also for the data sharing business.

Connected Product

The Business Developer at the Aftermarket Actor says that they would like their connected product to be in the center of the partnership, and create a business ecosystem around it. Therefore, the primary potential partners are not OEMs who have an interest in developing a similar product, but rather actors related to the connected vehicle ecosystem that can help to add value to the Aftermarket Actor's product. Another advantage of not partnering closely with the OEMs, which both the Aftermarket Actor and If talk about, is that they want the connected product to be well functioning for every automotive brand.

Data Product

Partners are essential for the mere act of sharing data but they are also important for other reasons. Porter and Heppelmann (2014) advice companies to not overestimate their own internal capabilities of handling data. They argue that smart and connected products demand cooperation throughout the value chain. Veen Huis at Scania argues that it is important to realize that if you are unable to handle the new era of digitalization, you might unwillingly move back in the value chain, and with that, you might lose influence. A question raised by Luttemo at If is whom will own the value chain when sharing data in ecosystems. Another aspect is that actors might be reluctant to establish cooperative business models. According to Luttemo at If, it will increase the complexity of the business model. Companies must decide how much and which parts of the business they want to share. This is a concern both along the value chain and between actors in a business ecosystem. Djerf at Mediamobile

explains that their different partnerships demand different business models for different collaborations. As mentioned above, depending on what kind of partnership they use different pricing models.

Further on, Bock et al (2015) argue that governments should encourage cooperative business models to capitalize on the new digital technologies. World Economic Forum (2014a) urge the governments to support the cooperation and investments along the value chain in the connected world, as well as governmental support to build the infrastructures for new technologies (World Economic Forum, 2014a). Nielsen at Ericsson also points towards the need for public-private partnerships in order to build the infrastructure. He says that companies will not be able to build the networked society themselves.

An essential practical issue with data sharing is, as mentioned by Djerf at Mediamobile, are the different technological ways of sharing data. Standards need to be developed in order for all actors' systems to be compatible within a business ecosystem. Parmar et al (2014) suggest data trading as a way of innovating the business. However, Parmar et al (2014) also conclude that there is a problem with the lack of standards for sharing and combining data. Volvo Car raises the same concern, in terms of finding an agreement on a common standard. They mention the cloud platform as a good middle hand. That way, actors could connect to the same cloud, using the transmission technology of their choice. Israelsson also says that it is easy to connect clouds to each other. Hence, it is easier to partner with actors that already have an existing cloud solution. Volvo Cars, Scania and Mediamobile talk about Ericsson as a software company and potential facilitator to connect actors, since they have the network infrastructure for cloud technology. This is also highlighted by Pierre Audoin Consultants (2015), stating that automobile manufacturers need to partner with IT- and software companies to support their connected services. On the other hand, Mosquet et al (2014) argue that OEMs need to partner up with other OEMs, governments and regulatory agencies in order to handle the legal aspects of data sharing. The legal aspect is what Nielsen at Ericsson points out to be the most essential to address right now. Mosquet et al (2014) also argue that the technology is already in place and the security issues are what need to be dealt with, something mentioned by Broberg at Stokab as well.

Key takeaways

- It is crucial to identify the actors to partner with in order to establish a working business ecosystem, which can help create value for the company's customer.
- Different partnerships demand different business models. When establishing a cooperating business model, it is important to not unwillingly move backwards in the value chain.
- It may be difficult to agree upon a mutual technology standard among actors. A step on the way could be to utilize IT and software companies skills within connectivity infrastructure.

5.10 Cost Structure

In a business model, costs are primarily derived from resources, activities and partnerships (Osterwalder & Pigneur, 2010). In connecting a product and sharing data, there are investments to be made. As argued in the literature, the key activities need to be attended to, and partnerships need to be built and maintained (D'Emidio et al, 2014; Rüssmann et al, 2015; Nanry et al, 2015). These are actions that inevitable come with a cost. The respondents explicitly touch upon the cost issues in the developing phase of connectivity or data sharing. In terms of R&D costs, Volvo Cars and Veen Huis at Scania talk about initial costs of setting up the required conditions for data sharing, as well as developing connected features in products.
Another cost that the respondents describes as problematic, are the costs associated with the fees to the telecommunication operators for the vehicles' or data transmitters' use of the mobile Internet. For producers of connected vehicles today, this cost must either be covered by a markup of the price of the car, or paid by the customer. Djerf at Mediamobile explains that they transmit data via radio, since it is inexpensive compared to the network operators' fees. Further on, this is even more complicated when it comes to data transmission across borders, since international data roaming tend to be very expensive. At Volvo Cars, the customer is charged with a subscription fee for the connected services provided, which, as discussed in section 6.6 Revenue Stream, has not been well received by the customers. Veen Huis at Scania hopes that companies like Ericsson, with their technological skills and network infrastructure, will be able to come up with a better way to transport data, so that the OEMs will become independent of the telecommunication operators.

Connected Product
When connecting products, the possibility to digitize the value chain and services arises. In line with what Nanry et al (2015) say regarding the benefits in digitizing the value chain, the cost structure changes. Parmar et al (2014) explain that with sensors in the products, upcoming failure can be alerted and costs saved. With the sensors comes the possibility for the automation and analytics-driven services that Rüssmann et al (2015) discuss. These functions could ease the aftermarket and reduce costs in repair services, something that Volvo Cars explain is one of the reasons they are connecting their cars.

Data product
The costs associated with the data product are the costs of collecting, processing, storing and transferring the data. Veen Huis at Scania claims that data storing is cheap, and the connected product generates the data collection. Thus, it does not constitute an additional cost. This leaves the cost of processing and transferring the data, to be the cost important to address by the actors sharing data. Proper data processing is of great importance, as Ekman at the DPA points out. In order to share personal data, customer consent is needed, in other cases the data has to be anonymized, which demands resources.

Key takeaways

- When identifying costs for connected products, actors primarily address the initial R&D costs.
- A vital cost to address when connecting products and sharing data, is the data transmission cost to the telecommunication operators. A feasible solution to handle these costs is vital.
- Connected products could help to reduce cost in the aftermarket services.

6 Conclusions and Final Remarks

In this chapter, the conclusions from the analysis are presented. Thereafter, the study's practical and academic contributions are discussed, as well as the authors' proposal to future research within the field.

6.1 Conclusions

In this study, it has been identified that data sharing within a connected business ecosystem incorporates two different types of products, and with them, two different business models. The first product is the *connected product*, which is the core product with connected features. The second is the *data product*, which is the data generated by the connected product, see figure 4, page 63.

The authors conclude that both products are parts of data sharing within a connected business ecosystem. The connected product involves ecosystem actors in terms of data transmission, partnerships and infrastructures, and the data product is the product of the mere act of sharing data between actors. The connected product must exist in order for a company to be able to establish a business model for the data product. The different products result in different factors to address when developing the business models.

6.1.1 Constructing a Business Model: Connected Product

The demand from customers for connected features in vehicles are increasing and connected products are something that will alter and enhance an OEM's value offering. Preparing to digitize the product and getting the management on board are crucial in order to stay competitive as the industry gets connected. Doing this fast to create value for the customer, is also important to stay competitive.

However, there are risks associated with data sharing, particularly when handling personal data. These risks are important to understand, and the consequences of wrongfully handling personal data could potentially be damaged brand reputation or legal ramifications. The security and safety of the customer's privacy and integrity need to be regarded for the connected product in order to maintain a good customer relationship. Therefore, it is of utter importance to establish an adequate data security system.

Further on, as the society becomes connected, it is important for companies to do the same, in order to not unwillingly move backwards in the value chain. When building a business model, it is crucial to identify the actors to partner with in order to establish a working business ecosystem, which can help maintain the company's position and create value for the customer. However, the advantage of using one's own channels for the connected services is the independence of other actors.

The cost structure for the connected product needs to be addressed promptly. The identified costs of connected products are the initial R&D costs when developing the connected product, and the costs for the data transmission to the telecommunication operators. In the connected industry, the issue regarding the fees for data transmission via mobile Internet must be solved. Finding ways to negotiate down the costs, or ways to mark them up, while still maintaining an attractive value offer, is vital for the business model. To cover these costs today, the revenue streams from connected products are generated by charging the customer. However, this pricing strategy needs to be reinvented in order to maintain the appeal of the product for the customer.

The conclusions above result in the following important factors;

- Digitize the core product and company
- Establish a data security system
- Choose technology for the product's data transmission
- Regard value chain positioning
- Manage data transfer costs

6.1.2 Constructing a Business Model: Data Product

As an actor building a business model for data sharing, it is important to fully understand the data customer's perspective. Thus, it is important to understand what kind of data potential customers are interested in. However, the data sharing business is still developing and data customers do not always know what kind of data they need. In this case, focus needs to be on guiding the customer. As an actor with industry knowledge, the company has the potential of being the expert on its data offering. However, in order to gain that expertise, IT and ICT knowledge need to be established or acquired.

Revenue streams from the data product could either be monetary or in the shape of data exchange. Business models for data sharing could use both, depending on if the data transaction is one-way or two-way route. It is desirable to find a pricing mechanism for the data sets. According to this study, there is no best practice within this field yet. However, trading data for other data is a way of going around the problem, while the essential factor is to appreciate the data's value to the customer. When sharing data, the customers are actors within, or linked to, the business ecosystem. Therefore, the business model needs to be adapted to a B2B relationship.

Furthermore, it is important to understand and address the strategic risks associated with bad publicity or legislative consequences when handling personal data. Therefore, a key resource for a business model when sharing data is, also for the data product, an adequate data security system.

The business of data sharing within ecosystems would benefit from some kind of platform where data can be shared. Today, actors are uncertain of how and when this will be introduced and by whom. Further, actors use different technologies when distributing data, and it may be difficult to agree upon a mutual technology standard.

However, the business model should address the potential establishment of a platform, and preferably include a solution to how data could be merged or gathered. A step on the way could be to utilize IT and software companies' skills within connectivity infrastructure. Further on, as a data sharing actor, a company needs to determine what data is essential to its competitive advantage and keep this data in-house. In order to obtain a successful business model for data sharing, new emerging costs need to be addressed. Primarily, these cost are associated with the processing and transferring of data.

Finally, in order to enable data sharing business opportunities between actors and industries, it is vital that governments facilitate infrastructures for data sharing.

The conclusions above result in the following important factors;

- Understand the customers' true needs
- Acquire IT and ICT expertise
- Establish a data security system
- Strive towards a data sharing platform and technology mutual standard

6.2 Practical and Academic Contributions

This study's practical contributions evolve around the assessment of how to establish business opportunities in a new field, built on new technology. As the empirical field within this study is fairly unexplored, insights from this study could contribute to actors wishing to build business models on connected products and data sharing in the future.

The practical contribution also includes the business model application of the industry views. This, in order to provide new insights for Ericsson, who was the issuer of this study, and also an actor within the automotive business ecosystem. The study's empirical research as such, as well the Business Model Canvas application in the analysis, will be useful for areas within the Ericsson Industry & Society unit in their future work.

Furthermore, the gathered empirical data generate a practical contribution in illustrating different actors view upon the business of connected products and data sharing. This is of interest for other actors in the business ecosystem, as well as the entire automotive industry.

As for the academic contributions, this study applies the academically established Business Model Canvas framework on the contemporary subject of connected products and data sharing within a business ecosystem. From a business perspective, research regarding these topics is mostly covered by consultancy firms. As a result, this study contributes with an academic point of view on data sharing within business ecosystems.

6.3 Future Research

Connectivity and data sharing within the industry are quite new phenomenon. They constitute new business opportunities based on new technology. Therefore, there are a lot of possibilities to research the topics further in the future. This study has examined the phenomenon from a business model perspective. However, perspectives addressing consumers or value chains could provide deeper and further insights.

One suggestion would be to conduct a study focusing on the consumer or end-users point of view on data sharing. For example, Ekman at the DPA said that as a consumer, it is crucial to understand the agreements one sign. Once the customer has given the permission for a company to store information about her, she does not have legislative support to get them to delete that data (Ekman, 2015). The implications of what this means in practice for businesses as well as consumers would be interesting to investigate.

Additionally, an interesting aspect is the different approaches in legislation of data sharing in different regions, which will be a relevant topic as the society becomes increasingly global. Within the EU, legislation is foremost aimed at protecting the individual, regulating how and what data companies and organizations are allowed to collect, whereas is the United States, the responsibility lies to a higher extent on the individual (Ekman, 2015). Regional borders are erased when infrastructure becomes digitized and wireless, leading to a need for countries to collaborate. Therefore, this subject would be interesting to explore from a global legislative point of view.

Furthermore, a possibility is to further investigate and problematize the B2B and B2C relationships involved in connectivity and data sharing. It would be interesting to research the characteristics of these relationships within connectivity and data sharing, and how they change the original customer relationship. Finally, an interesting future research would be to address another empirical case, i.e. another connected business ecosystem.

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Appendix 1: Interview Guide

Below is a representative interview guide. The questions were changed depending on the actor interviewed, however, the structure was the same in all interviews. In parentheses are sub-questions, which were asked if the respondent was unable to understand the main question.

Is it okay if we record the interview?
Is it okay that we write your name and title, and the company name in the report?
Tell us about you and your job at [the company]:

Technology
Today
What connected services are you offering your customers today?

How do [the company] collect data from your connected products?

What do you know about what your competitors do regarding connectivity?

In short and long term
What connected features is [the company] planning for your products or services?

How will data sharing between players work in the future? Will one of the players be the "hub"/platform" or will a new neutral organization or platform would have to be created?

Is [the company] interested in real-time data?

Utopia
What do you think will be the technology used in the future? Will it open up for completely new opportunities?

Business opportunities
Today
What difficulties have you encountered when introducing connected features and data sharing? Internally at [the company] and externally for your customers?

What is the value of you connected features for you customers?

How are you customers informed about you connected features and data sharing?

What is the profit for [the company] generated by the connected features? What would you like in return if you were to share the data for free?

What collaborations with governmental authorities do [the company] have?

In short and long term
What is the next step for [the company] regarding connectivity and data sharing? (Collect more or other types of data?)

What obstacles do you think need to be overcome in order to introduce data sharing? Internally at [the company] and externally for your customers?

What initiatives would you like to see from authorities in order for [the company] to be able develop the features you want?

Will data sharing be something that changes your core business?

Will data sharing affect you business models? If yes, in what way?
(Do you see [the company] as a product or service company in the future?)

How would you like to share the data?
(Sell in packages, trade for other data, share on a open platform?)

What actors do you think are interested in the data that your products generate?

Utopia
What is the utopia for data sharing within your industry?

Security
Today
Who owns the data generated by your products?
(The owner of the product or [the company]? Can you own the data together?

What are the legal aspects regarding connectivity and data sharing in your industry?

How does [the company] protect the user's data against data hacking?

How is [the company] working with risk management regarding the data?

Does [the company] have the right to share your data with external actors? How is that regulated, by agreements or legislation?

How does the data sharing work for [the company]? What data is shared?

In short and long term
What is in the pipeline regarding laws and regulations for connectivity and data sharing? How would [the company] like it to be?

Utopia
What is the dream scenario regarding data security? Is it possible to get there?

Appendix 2: Technology Review

Below, basic technical terms and concepts in order to familiarize the reader with the technologies behind connected features in automobiles are presented.

Radio

Radio is a way of wirelessly transmitting information through the air using radio waves. Radio is sometimes referred to as radio frequency in order to not confuse it with radio receiver, which is the device receiving the radio signals. Radio signals can travel hundreds of kilometers, where the range of the signals depends foremost on the intensity of the transmitted signal, i.e. the strength on the transmitting device, and the magnitude of the disturbing noise. (Wikipedia, 2015b)

Wi-Fi

Wi-Fi, acronym for Wireless Fidelity, is a technology that allows electrical devices to communicate in computer networks, using certain radio frequency bands. It is a WLAN (wireless local area network) product based on certain standards defined by the IEEE (Institute of Electrical and Electronics Engineers). The range of one Wi-Fi access point is about 20 meters, but that can be extended by connecting additional access points. (Wikipedia, 2015c)

Mobile Network

A mobile network, or cellular network, is a network of land cells each equipped with a permanent base station. The base station is a transceiver (an antenna that works as both a transmitter and a receiver) that can connect to portable transceivers within the cell, for example a mobile phone or a connected car (Wikipedia, 2015d). The standards of mobile communication have developed from the first generation, to GSM (Global System for Mobile Communications, also known as 2G), to 3G, to 4G and now the fifth generation (5G) is on its way. There are several differences between the generations. However, important for this study is that they operate on different frequency bands, and they can carry different amount of data (Pereira & Sousa, 2004). The 5G network is under construction and some of the visions for this new standard are better flexibility, security and speed (Ericsson, 2014a).

Telematics

Telematics is defined as “the convergence of telecommunications and information processing”, and was developed as a way to connect in the connected society. Consumer telematics, or Telematics 1.0, was the first version, launched in the 1990’s with focus on safety and security. It developed further to Telematics 2.0, a more flexible infrastructure, which is built to accommodate the demand from the expanding connected society. Consumers want bandwidth equipped to handle the increasing data transmission, and the upcoming Telematics 3.0 will be developed to comply with

cloud computing (Verizon Telematics, 2013). Telematic connection in cars has been a standard since 2001, and according to the Business Developer at the Aftermarket Actor, 70 percent of the cars on Swedish roads today, have the equipment to potentially be connected through telematics (Business Developer, 2015).

Cloud Computing

Cloud computing refers to a method of running application software and storing data in a central computer system or data center, providing users access through the Internet. Cloud computing software includes services such as Software as a Service (SaaS) and Platform as a Service (PaaS). Storage in data centers refers to Hardware as a Service (HaaS), and is what is most commonly spoken of as "the cloud". Cloud software applications are offered by for example Google and Amazon. However, social media services such as Facebook are also considered cloud computing. The connection to the cloud can be everything from wireless technologies, such as the mobile network, to physical connection like fiber optics (Britannica, 2015c). Nowadays, cloud service is a very popular way of storing data, Ericsson I&S's solutions Connected Vehicle Cloud and Connection Traffic Cloud, for example, are using this computing technology (Wallin, 2015).

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