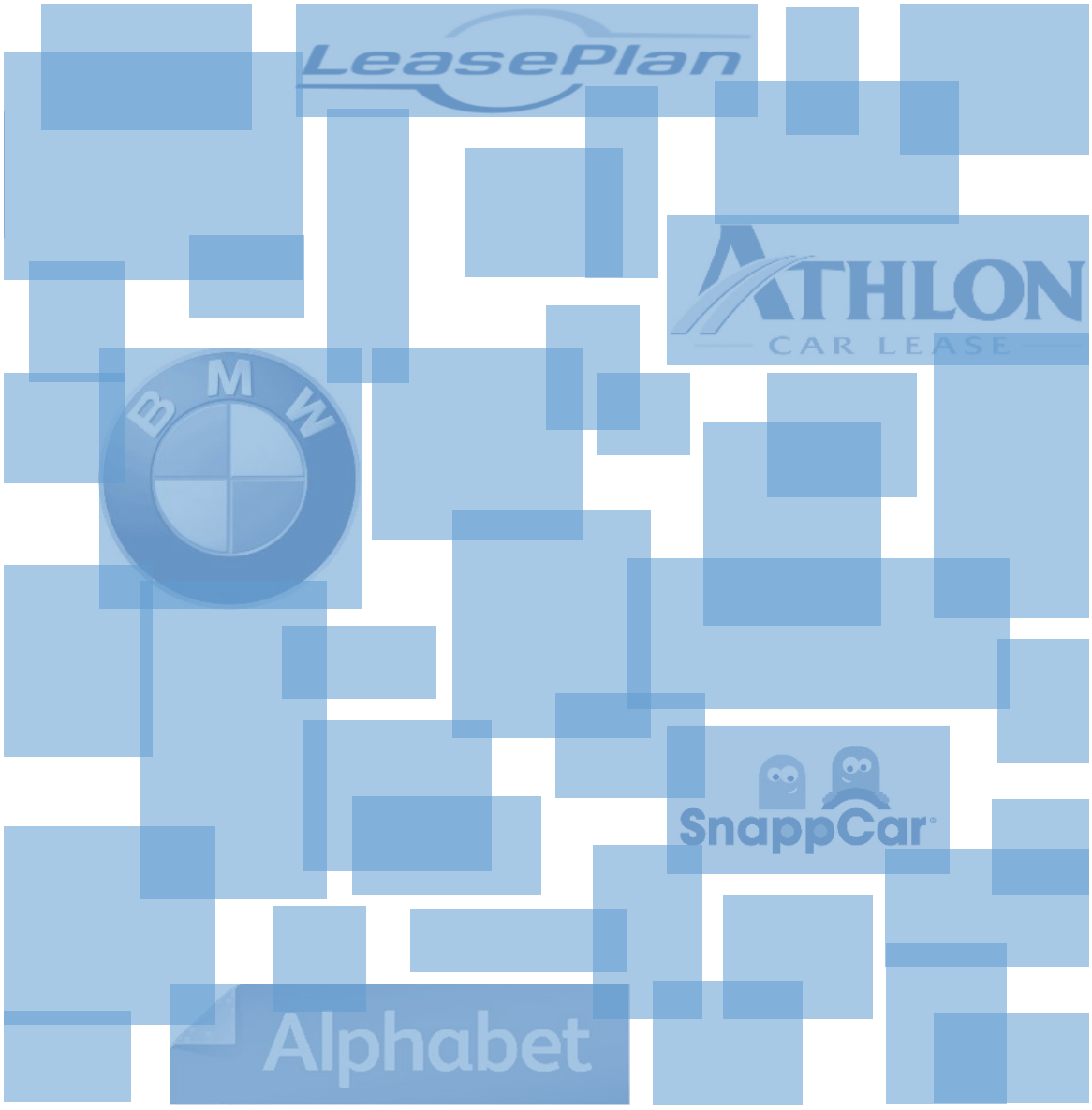
Changing value networks in the downstream activities of the automotive industry due to transition to services



Jorn J. van Wijnen

Graduation Thesis
Master of Science in Management of Technology
Delft University of Technology
2014

Title

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Document

Graduation Thesis

Keywords

Automotive Industry, Services, Transitions, EP, PSS, Value Networks

Author

Jorn J. van Wijnen
Student number 4116739

University

Delft University of Technology
Faculty Technology Policy and Management
Master Management of Technology

Graduation committee

First Supervisor
Dr. Laurens Rook
Assistant Professor at section Technology, Strategy and Entrepreneurship

Second Supervisor
Dr. Scott Cunningham
Assistant Professor at section ICT

Chair
Prof.dr. Cees van Beers
Head of section Technology, Strategy and Entrepreneurship

Number of pages of this report

104

Date of publication

February 2014

Delft University of Technology

Preface

This Master Thesis marks the culmination of my academic career. Although it took a while to find the perfect Master Thesis topic, I am pleased that I got the opportunity to shape my own research completely. To be able to explore a topic which is so close to my personal interests really raised my dedication and kept me motivated throughout the project.

First of all, I would like to thank the interviewees at Alphabet, Athlon Car Lease, LeasePlan, SnappCar and BMW for their time and effort. I appreciate their interest for the research topic and their willingness to find time in their busy schedule for the interviews. Their collaboration and rich insights made this research project an interesting and worthwhile experience. Furthermore I highly value the guidance and constructive feedback of the chairman of my TU Delft graduation committee, Prof.Dr. Cees van Beers, and second supervisor, Dr. Scott Cunningham. Their feedback helped me to enhance the quality of the research to a great extent and supported me to critically reconsider my decisions. Foremost I would like to express my gratitude to my first Supervisor, Dr. Laurens Rook. His prudent guidance, patience and enthusiasm directed me throughout this research project. Since we first met in October 2012, his support ranged from helping to shape my research topic, to reviewing motivation letters in German and arranging attendance to the Energy forum conference. But foremost, his manner of guidance increased the academic quality of this thesis and made developing this Master Thesis a true pleasant affair.

Furthermore, I would like to put my appreciation forward to my friends for making studying such a fun experience and to Anne-Marie for lending a listening ear and all the moments of pleasure. Finally, I would like to express my dearest gratitude to my family, and especially my parents, for their unconditional support and loyalty.

Jorn van Wijnen
Utrecht, February 2014

Executive Summary

The saturated West-European automotive market is facing a transition to answer the changing customer needs of Generation Y and the global trend of urbanization. Furthermore technological developments in the area of V2X communication and connectivity is about to change the way we think about moving from A to B. This is changing the dynamic of the automotive industry to a large extend. Its outcomes will shape how actors in the automotive industry position themselves to create and secure revenues in the future. Therefore actors in the downstream activities of the automotive industry are looking to diversify their revenue streams. Recently, actors as original equipment manufacturers (OEMs) and fleet management companies (FMCs) have started to explore the mobility landscape. This can be seen in innovative mobility offerings, Mobility as a Service (MaaS), as carsharing. Nowadays, FMCs are increasingly offering customers more than just a car to meet their total mobility needs. They add value by incorporating new services as parking, carsharing and telematics services. The idea of OEMs creating standalone business units responsible for mobility products seemed an implausible situation five years ago. Given the potential threats and differentiation from their core business of producing and selling cars. Today, new mobility business models as carsharing, parking management, integrated mobility services and connectivity increasingly form an integral part of the OEM service offerings.

Research question

Since the established automotive companies are not able to answer these all changes, cooperation with new actors is essential to offer new services. Therefore the research identified the transition to services in the West-European automotive industry and defined the changes in the value system, by answering the MRQ:

> *How is the value creation structure of the downstream activities in the automotive industry influenced by the transition to services?*

The research builds upon theory on the transition to product related services. The concepts of Product-Service Systems (PSS) and Extended Products (EP) are combined in an EP/PSS matrix to identify the services in which the company is active. The value system of the automotive industry is identified as a value network for the downstream activities. This is grounded in scientific literature on the market-based view and business network theory.

Methodology

The methodology of this research project follows a multiple case study approach with a longitudinal element. Two company cases are investigated: the OEM (BMW) and FMCs (Alphabet, Athlon Car Lease and LeasePlan). Based on a quasi-natural experiment these cases provide a diverging context for the constructs investigated. The interview data was coded and analyzed using specialized software. The data was analyzed by mapping network views and co-occurrence tables. Based on the NVA a value network of services was identified for all four focal companies investigated. These maps provide a clear overview of the service offerings and the associated strategic partners.

Findings

The economic trend of differentiation into services is found to be highly relevant and is considered central to the structural changes in the downstream activities of the automotive industry. The growing needs of customers related to mobility bring challenges as well as opportunities for OEMs and fleet management companies. Following the data analysis, the changes in the value

creation structure today are based on transitions in the core business, technological developments and a changing customer behavior (from car ownership to car usage). These transitions are mainly driven by a trend of urbanization and changing customer needs of the next generation (generation Y). These transitions have a significant impact on the future landscape of the automotive industry. New services can foster new growth potentials, create customer loyalty and barriers to change in the saturated West-European automotive market. Analysis of the FMC case identified a differentiation into services in the area of mobility services (e.g. carsharing) and consultancy services. The OEM case indicated a transition to product related services in the area of connectivity and (E-) mobility services. The new mobility concepts increase the need to align the downstream activities of the automotive industry, fostering cooperation among the actors. Value will increasingly be added by actors in the downstream activities of the automotive industry through differentiation into services. The value structure becomes more networked, due to increased cooperation with strategic partners. This results in an extended networked automotive value system.

Practical recommendations

Practical recommendations focus on the West-European market only and are twofold for the FMCs and OEMs. The West-European automotive market has a large potential for carsharing services. Since the market is saturated, differentiation into services is found to be a key source of value creation. Since fleet management companies have their core business in Products as a Service (PaaS), they should be able to expand their range of services quickly and become providers of Mobility as a Service (MaaS). FMCs should expand their differentiation into B2B carsharing and mobility consulting services. Ridesharing is now seen as a potentially important part of the integrated mobility solutions. The changing mobility landscape, the opportunity to effectively integrate ridesharing alongside other mobility offers leads to sharing services becoming an important element of an intelligently networked mobility. Therefore the FMCs increasingly move away from their traditional business model of B2B car financing, as identified in the EP/PSS matrices. OEMs originate from a contrasting context, where R&D, production, assembly and sale of products are the core business of the company. Interesting to see is that OEMs can realize advantages over pure service providers when they diversify into Extended Products. The OEM is recommended to use its strategic advantage of producing products by increasingly combing these with services to enhance value creation. This is essential to fulfill the customer needs in the future. Furthermore the expanding attention to services ensures customer contact and increases the revenues obtained during the use phase of their product. In practice this causes a transition in the core business of the OEM towards a provider of individual mobility. This transition is made possible through their financial services divisions and by establishing strategic partnerships with established service providers. Since services are customer specific and feature more intangible components than physical products, services create information asymmetry. This enhances customer loyalty, increases switching costs and raises barriers to change the service provider. Therefore service differentiation can foster new growth potential for product bound industries like the mature automotive industry.

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Abbreviations and Technical terms

Alphabet	Fleet Management Company, subsidiary of the BMW group
AlphaCity	Full service, station to station corporate car sharing platform on a leasing basis for private or business usage. Aims to reduce TCO of mobility for a company, established by Alphabet in 2012.
Assembly line	Manufacturing process in which interchangeable parts are added to a product in a sequential manner to create a finished product. The first moving assembly line was introduced by Ford and used a conveyor system
Athlon Car Lease	Fleet Management Company based in the Netherlands
B2B	Business to Business
B2C	Business to Consumer
BEV	Battery Electric Vehicle, see also E-mobility
BMW AG	Bayerische Motoren Werke AG is a German premium multinational OEM, includes brands like BMW, Mini and Rolls-Royce Motor Cars
Buddism	Introduction of the body-chassis technology by Budd in 1914. Combined with a press and jig technology this provided enormous economies of scale
Captive	Fleet Management subsidiary of a large OEM (e.g. BMW FS)
Carsharing	Type of car rental, only pay for usage for a short period of time. Easy access to mobility when needed, without the expense and hassles of owning a car
Connected car	Car that is equipped with internet access for V2I, V2X, V2V communication
CSO	Carsharing Operator (e.g. SnappCar)
E-mobility	Electrical mobility, battery electric vehicles, see also BEV
EP	Extended Products
EV	Electric Vehicle, see BEV and E-mobility
Fleet Management	Fleet Management is the operation of a large fleet of cars (e.g. LeasePlan)
FMC	Fleet management companies
Focal Company	Company with the central role in an industry by continuously operating value adding processes (Ritter & Gemunden, 2003). The focal company decides and mobilizes which actors are inside the key environment (Ojasalo, 2004). It is the initiator of business action and conceives, designs and produces the product or service
Fordism	Mass production of inexpensive goods coupled with high wages for workers. Using a combination of standardized parts and a moving assembly line for mass production. Introduced by Henry Ford in 1909s for the production of the Ford Model T
FS	Financial Services, the finance, banking and leasing division of OEMs

Generation Y	Demographic cohort, generation with birth years starting around 1983 till the early 2000s. Are more dependent on smartphones than cars. Pragmatic idealists & civic-minded, also named Millennials
GM	General Motors a multination holding corporation, based in the US. It was combined the largest OEM between 1931 and 2007, The Corporation includes automotive brands like Buick, GMC, Cadillac, Chevrolet, Holden, Isuzu, Opel and Vauxhall
IVI	In-Vehicle infotainment
JIT	Just-in-Time, a production strategy focused on continues improvement and reduction of in-process inventory to maximize efficiency
Kaizen	Japanese for continuous improvement of manufacturing, engineering and business management
LBS	Location Based Services
Lean production	Production practice to preserve value by eliminating waste. Derived from the TPS
LeasePlan	Large Fleet Management Company, headquarters in the Netherlands
MaaS	Mobility as a Service
Modularization	Degree to which systems components (modules) are separated, recombined and used in different systems to drive multiple functionalities
NVA	Network Value Analysis
OEM	Original Equipment Manufacturer (Car manufacturer). Assembles the car and manufactures products or components that are purchased by another company and retailed under that purchasing company's brand name.
P2P	Peer to Peer
PaaS	Product as a Service
PAYD	Pay As You Drive, pay per use (minutes, hours, days etc.)
PLC	Product Life Cycle
PSA	Peugeot S.A. a French multinational OEM, includes brands like Peugeot and Citroen
PSS	Product-Service System
Ridesharing	carpooling
RMT	Repair, Maintenance, Tires: part of fleet management services
RTTI	Real Time Traffic Information
Servitization	Transition to services

Services	Advisory, Banking, Connectivity, Financing, Fleet management, Insurance Leasing, Maintenance and repair, Mobility, RMT management (Repair, Maintenance Tires), Telematics, Training, Travel/roadside assistance (Breakdown services), Used car
Sloanism	Multi-brand market strategy "a car for every purse and purpose". Introduced by A. Sloan of GM in the 1920s
SnappCar	Community based platform for Peer to Peer carsharing
Supplier	Supplier of parts to the OEM or other sub-suppliers
TCO	Total Cost of Ownership
TIER	Supplier of parts or subsystems to the OEM, TIER-1 is a supplier directly linked to the OEM, producing semi-finished products. Other suppliers are TIER-2 and TIER-3 suppliers, producing a (small) part of the final product
Toyotism	Reduction of the so called seven wastes of Toyota to improve customer value. See also TPS and lean production
TPS	Toyota Production System, see also JIT, lean production and Kaizen
Value System	Network or chain of organizations involved in the production and delivery of a product or service to the customer
Volkswagen Group	Volkswagen A.G. is a German multinational OEM, includes an automotive division and a financial services division. The automotive division includes brands like Audi, Bentley, Bugatti, Lamborghini, Porsche, SEAT, Škoda and Volkswagen

Description of key persons

Budd, E.	Edward G. Budd (1870-1946) founder of Budd Company, invented the pressed steel frames for cars. Developed with André Citroën the groundbreaking Citroen Traction Avant, the first unibody, pressed-steel car with front wheel drive
Ford, H	Henry Ford (1863-1947) the founder of Ford Motor Company and the first to introduce mass production of cars
Hertz, J.D.	John D. Hertz (1879-1961) the founder of the Yellow Cab Company. Acquired a rental car business, renaming it in Hertz Drive-Ur-Self Corp. Forming the basis for the car rental industry, bought by GM in 1926
Panhard R.	René Panhard (1841-1908) and Emile Levassor (1843-1897) the founders of Panhard, a French car manufacturer. They invented the Système Panhard which became the standard layout for cars for a long time. This system specified a front engine, rear-wheel drive, and an internal combustion engine (ICE) with a sliding gear transmission.
Sloan, A.	Alfred P. Sloan Jr. (1875-1966) the CEO of GM between 1920s and the 1950s. Responsible for organization innovation (M-form divisional structure), multi brand architecture and introduced the annual model modification

1 Introduction

After a period of technological stability, in many respects the automotive industry is again facing another transition to answer the needs of the saturated West European market. Although mobility will remain to be fundamental to our way of life, the next generation of consumers (generation Y) is demanding more flexibility in mobility. The global trend of urbanization is changing the way we think about moving from A to B.

> "It is all about the mindset of people, we are moving away from hyper consumption in the past century to a century of collaborative consumption, therefore networks are key enablers" (interviewee 6, co-founder P2P carsharing platform)

The Automotive industry is increasingly looking for solutions to cope with these changes through technological developments as the Connected Car and E-mobility. This is changing the dynamic of the automotive industry to a large extend. Its outcomes will shape how actors in the automotive industry position themselves to create and secure revenues in the future. Therefore actors in the downstream activities of the automotive industry are looking to diversify their revenue streams. New services are bundled, to offer subscription-based solutions as Pay-as-you-Drive (PAYD), Mobility as a service (MaaS) and Location-based-services (LBS) (Knoppe, 2012) (Monteiro, Maia, Serra, & Neves, 2012) (Lessmann & Haenle, 2013) (Weiller, 2012). These developments facilitate transitions towards E-mobility and an increasing demand for mobility solutions such as carsharing, causing the implementation of new service business models of the automotive industry (Raine & Wellman, 2012) (KPMG, 2012) (Makela & Pirhonen, 2011). Due to these developments the role of services in the automotive industry is expected to grow. New segments outside the traditional automotive value system are explored, to increase value creation. As a result the distinction between products and services starts to blur.

> "The line between products and services is blurred to a large extend and will fade away more and more in the future" (interviewee 6)

This transition from product to service-oriented strategies to enable differentiation and value creation has taken place in other industries like in the IT (IBM evolved into a business and technology service provider) and printing services (Xerox evolved into a document management cooperation). In these industries services became increasingly important due to the limited growth potentials of product diversification and internationalization. The transition to integrated product and service solutions is expected to influence the value creation structure of the downstream activities of the automotive industry as well. Original Equipment Manufacturers (OEMs) and Fleet Management Companies (FMCs) are expected to offer integrated mobility solutions. This expansion to mobility is expected to bring new actors into the automotive value system, like energy suppliers, software companies and IT companies. Traditionally, these companies worked autonomously outside the automotive value system (Jing & Ziong-Jian, 2011). Competitive dynamics are expected to change since the offerings of OEMs and service companies are moving closer to each other. In this research project the influence of a transition to services is identified for the West-European automotive market. Chapter 1 starts with a brief description of the industry followed by the research objective, and the main research question including four sub questions. The chapter concludes with an outline of this thesis.

1.1 Industry Description

The capital structure of the automotive industry results in mass production and continues expansion. This structure causes market saturation, over supply and high levels of depreciation of new cars (Humphrey & Memedovic, 2003) (Nieuwenhuis & Wells, 2004). Therefore the current situation of the automotive industry in Western Europe is characterized by structural overcapacity of 22% (5 million cars per year) (Becker, 2006). Furthermore the market fragmentation makes sales prediction difficult, OEMs and suppliers have to make investment and tooling decisions based upon anticipated volumes. This makes the market vulnerable to slight fluctuations and the saturation of mature markets transforms this vulnerability into a cycle of profit and loss in the industry (Orsato & Wells, 2007). This paragraph describes the general structure of the automotive industry by identifying the upstream and downstream activities in the value system of the automotive industry. When the automotive industry is mapped on a high level, it consists of upstream suppliers and downstream service providers, see Figure 1. The central player in the automotive value system is the Original Equipment Manufacturer (OEM). There can be identified three types of OEMs: the high volume full range producers, the specialist producer, which occupy the upper market and compete on the basis of differentiation and the niche producers, focusing on exclusivity and extremes of performance (Nieuwenhuis & Wells, 2004). Production, assembly and sale of cars and spare parts has been the primary source of value creation for OEMs for several decades. But this business model has been increasingly characterized by a lack of value creation because of its inability to capture the earnings associated with the complete life cycle of a car (Nieuwenhuis & Wells, 2004) (Wells, 2010). The OEM can be divided into an automotive division (production and sales of cars) and a financial services division (financing, fleet management, mobility services).

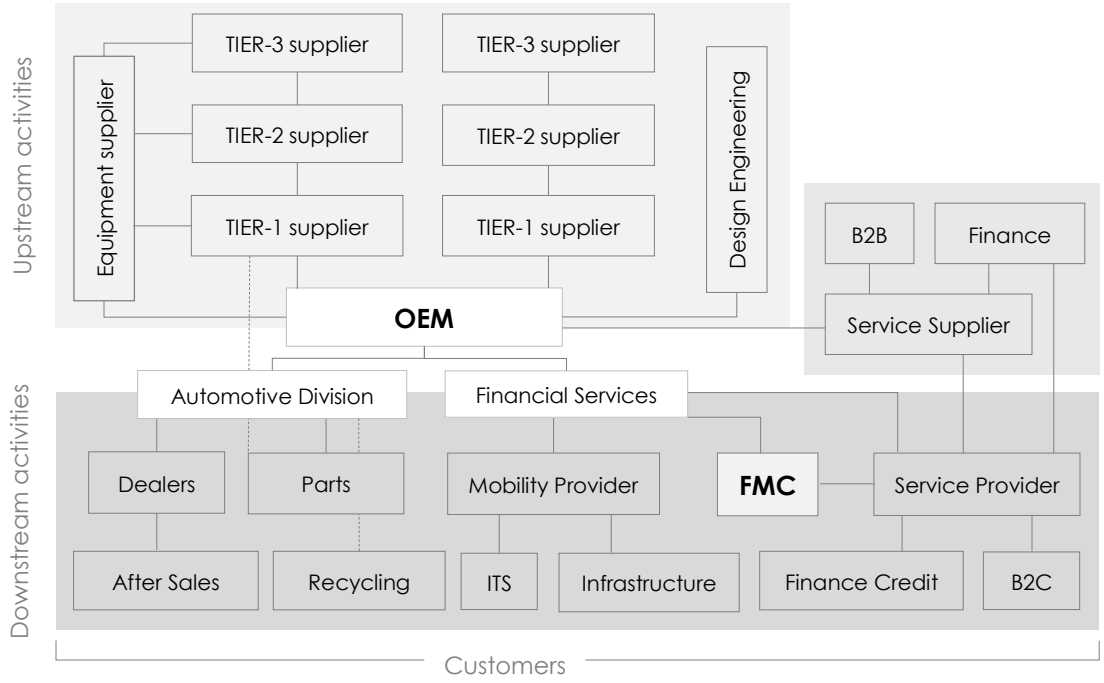


Figure 1: Automotive Value System (Lung, 2004)

The upstream activities of the automotive value system are fulfilled by suppliers. Suppliers assemble, produce, and design sub-systems for the production and assembly of a car. The

upstream value chain is divided in three suppliers. The TIER-1 supplier is a system integrator, increasingly providing complete modular subsystems to the OEM. The TIER-2 supplier is the system specialist, commanding high technological development competence and low installation activity. Finally the TIER-3 supplier is the parts and component supplier and characterized by relatively small installation activity and low development activity. For a more detailed overview of the upstream activities in the automotive industry, see Appendix A. Due to the interdependencies within the value system, all upstream suppliers and downstream service providers are influenced by increased concentration. The number of suppliers has decreased extensively, from 30.000 in 1988 to circa 3000 in 2015 (Becker, 2006). The main changes in the upstream system in the last decade are characterized by a reinforced competencies transfer trend, the continuation of suppliers' concentration via mergers and acquisitions, modularization strategies, diversification in activities and a significantly more complex system (Becker, 2006).

Downstream activities are strongly related to the sale and use phase of a car. Key independent actors in the downstream activities are dealers, fleet management companies and other service suppliers. Over the years new services have been incorporated by the automotive industry as car finance, insurance, accessories and replacement parts (Nieuwenhuis & Wells, 2004). Furthermore leasing type models are offered rather than outright sales to customers. These leasing type models bundle cars with all-in service contracts are currently especially aimed at the B2B market on an all-in cost per km TCO (Nieuwenhuis & Wells, 2004). This market consists of three types of players: the OEM captives, the commercial bank and the independent finance and leasing company.

1.2 Research Objective & Questions

The objective of this research project is to identify the transition to services in the automotive industry focusing on automotive service companies merely active in downstream activities in Western Europe. In order to give insights in the areas of investigation the conceptual model is provided in Figure 2. The conceptual model shows the structure of the problem situation according to Bots (Bots, 1989). An increasing focus on services within the industry is expected to change the value network of the downstream activities of the automotive industry. These new service business models (EP/PSS, see paragraph 2.2) influence the value added by actors active in the downstream activities of the automotive industry as OEMs and fleet management companies. This is expected to result in a more networked value system. The emphasis on downstream activities arises from the predominance of services in this part of the automotive industry in which services are able to add value for the end consumer.

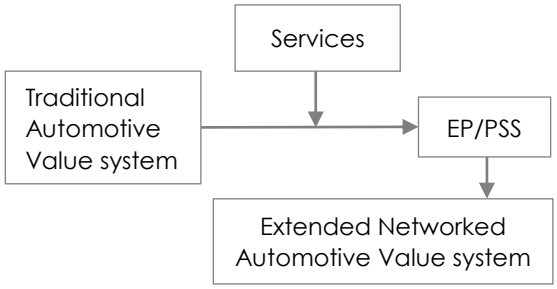


Figure 2: Conceptual model

The research goal is to *identify* the *transition* to *services* in the automotive mobility industry by defining the changes in the *value system*. Therefore the following main research question is:

MRQ: *How is the value creation structure of the downstream activities in the automotive industry influenced by the transition to services?*

In order to answer this main research question and structure the research project, four sub-research questions are posed. The main research question is divided into two parts each identifying a structural element of the research. The sub-questions are aimed at the identification of value creation (sub-question 2 and 4) and the transition to services (sub-question 1 and 3). Research question 1 is posed in order to gain insights in the theoretical framework related to services concepts, with an elaboration on *transition to services*, the industry structure and the relation to products embedded in the automotive industry.

RQ 1. *How can services be defined in relation to the automotive industry?*

A central part of this research project is to analyze *the value creation structure of the downstream activities in the automotive industry*. This part is answered in the second research question.

RQ 2. *How can the value creation structure in the automotive industry best be analyzed?*

In order to provide a longitudinal context for the research project, the developments in the automotive industry are investigated providing a rich background for the transition to services.

RQ 3. *What trends can be identified in the automotive industry in the past century, and what caused the structural changes?*

The final research sub-question provides a sneak peak of the future transitions in the automotive industry. Based on case studies the influence of services on *value creation* is investigated.

RQ 4. *How do actors add value in the downstream activities of the automotive industry in the future?*

1.3 Thesis Outline

This report started with an introduction to the topic, its research objective and questions. In chapter 2 the theoretical framework is established, first the core concepts of the research question are investigated by analyzing existing literature on value, services and industry organization. This results in a set of hypotheses and a conceptual framework, answering RQ 1 and 2. Chapter 3 contains the methodology description, based on a qualitative, multiple case study research design. In chapter 4 an overview is provided of the key transitions in the automotive industry in the past century. This period is divided into four phases, providing an answer to RQ 3. In the empirical part of chapter 5 a qualitative analysis is used to investigate the changes in the value network of services in the downstream activities of the automotive industry for an OEM and three fleet management companies. Therefore a case study research design with a longitudinal element is used investigating what trends influence the transition to services and the industry value creating structure. Chapter 6 describes the results of this research project answering the hypotheses introduced in chapter 2, and RQ 4. The final chapter, chapter 7, entails the discussion of scientific and practical relevance, outlines the limitations and recommendations and provides the conclusion by answering the main research question. Figure 3 provides an overview of the locations of answers to the Research Questions and Hypotheses per chapter.

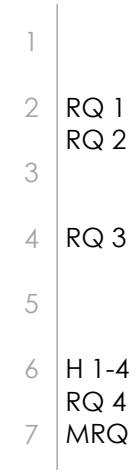


Figure 3: Thesis outline

2 Theoretical Framework

Based on the main research question this chapter describes the theoretical exploration supporting the core themes of the research on *value, services* and *industry organization.* The theoretical framework therefore consists of three parts, the first part begins with an elaboration on the central theme of value creation followed by an elaborated discussion on the transition to services. Scientific studies on service development were introduced in Anglo-American publications in the 1970's (Cavalieri & Pezzotta, 2012). Currently there can be identified various clusters of researches on the related topics in the scientific literature: servitization, Product-Service System (PSS), service marketing, new service development (NSD), service engineering, service operations, service infusion, Extended Products (EP), integrated solutions and service science (Baines, et al., 2009) (Lay, Copani, Jager, & Biege, 2010) (Matthyssens & Vandenbempt, 2010) (Akram, 2012). The second part explains the service related concepts as servitization, Product-Service systems (PSS) and Extended Products (EP), these concepts are combined in a matrix, answering research question 1.

RQ 1. *How can services be defined in relation to the automotive industry?*

Paragraph 2.3 describes industry organization concepts, distinguishing between the atomistic and relational approach. The atomistic (company centric) approach forms the basis for this research project by elaborating on the external market-based view. Combined with aspects from relational business network theory, Value Networks and NVA provide a strong academic foundation to analyze value and describing the value creation structure in the automotive industry. This answers the second research question.

RQ 2. *How can the value creation structure in the automotive industry best be analyzed?*

Based on the discussion of the relations between the constructs at the end of each paragraph, hypotheses are posed in paragraph 2.4. The hypotheses are used to test the relations between the constructs identified in the literature review. The hypothesis are verified or falsified in chapter 6. This chapter is concluded in chapter 2.5 with the delineation of concepts used for the analysis and operationalization of the conceptual framework introduced in previous chapter.

2.1 Value

The creation of *value* is central in the modern economy. The ability to create and capture sustained added value is often seen as the key measure of business success (Tukker, 2004). Understanding how companies differ is, according to Stabell and Fjeldstad (1998) "*a central challenge for both the theory and the practice of strategic management*" (Stabell & Fjeldstad, 1998). Alternative structures of value creation explain the differences in competitiveness of companies (Stabell & Fjeldstad, 1998). The definition of value differs, Allee (2000) defines value as "*A tangible or intangible good or service, knowledge or benefit that is desirable or useful to its recipients so that they are willing to return a fair price or exchange*" (Allee, 2000). Therefore value should include business relationships, internal structures, human competences, environmental health and corporate identity (Allee, 2000). Anderson et al. (1993) have defined value as "*the perceived worth in monetary units of the set of economic, technical, service and social benefits received by the customer firm in exchange for the price paid for a product offering, taking into consideration the available suppliers' offerings and prices*" (Anderson, Jain, & Chintagunta, 1993). Tapscott et al. (2000) use a more general definition of value, it is "*the benefit that a user gains from a good or service*" (Tapscott, Ticoll, & Lowy, 2000). Yet another approach is the one by Porter, according to Porter (1991) the term value refers to customer value from which the potential profit ultimately derives (Porter, 1991). Value is defined by Porter as "*the amount buyers are willing to pay for the product or service that a firm provides*" (Porter, 1985). In this case value can be measured by total revenue, a company is profitable when the value it commands exceeds the costs involved in creating the product or service (Porter, 1986). From the definitions stated above, for this research value is perceived by the customer and value is added by companies performing an activity which enhances the product or service. The purpose of a value creation analysis is to identify the competitive advantage (Stabell & Fjeldstad, 1998). In order to be competitive, companies can create higher value than their competitors by differentiation.

Concluding remarks

In this research project *Value* and *Value creation* are key constructs. In the highly competitive automotive industry value creation and differentiation are important sources of success. This research identifies the value added by companies through service offerings. The competitive advantage is identified by analyzing the value creation of companies active in the *downstream activities* of the automotive industry. The *downstream activities* are identified in paragraph 1.1 and involve value adding activities related to services, see paragraph 2.2.

2.2 Services

This paragraph elaborates on concepts related to *services*. First the *transition to services* is discussed, followed by an elaboration on several key concepts strongly related to this phenomenon as servitization, PSS and Extended Products. There are two logics from which to consider the transition from goods to services: the goods-dominant logic (G-D) and the service-dominant logic (S-D). In a goods-dominant logic service is seen as "*a type of (intangible) good and implies that goods production and distribution practices should be modified to deal with the differences between tangible goods and services*" (Vargo & Lusch, 2008). Whereas the service-dominant logic defines service as "*the fundamental source of exchange and implies the need for*

a revised, service-driven framework" (Vargo & Lusch, 2008). A company can decide which position to take on the goods-services continuum, from a goods-dominant logic to a services-dominant logic (Oliva & Kallenberg, 2003) (Vargo & Lusch, 2004) (Laine, Paranko, & Suomala, 2012). The service logic is getting increasing attention, this is consistent with contemporary business-marketing models which are moving from exchange in terms of products to concepts of value (Freitag, Westphal, & Guglielmina, 2012). The S-D logic represents a foundation to move from a manufacturing model to a service-provider model, where goods play a minor role. Related to this shift is the elimination of the producer-consumer distinction.

2.2.1 Transition to services

An economic structural change is observable, reflected by the increasingly significant contribution of the tertiary (service) sector to the economy. For several decades manufacturing companies have focused on product related strategies geared to cost reduction, technological innovation and quality improvement. Due to changes in the business environment which are driven by trends like globalization, outsourcing of secondary activities, increased competitiveness and increasing consumer demand, it is getting more challenging to retain this focus (Lay, Copani, Jager, & Biege, 2010). Companies have responded to this changing environment, to enlarge profitability and capture new revenue streams companies are increasingly making the transition to service offerings. Since Product differentiation is getting increasingly challenging service innovation an important field of research (Castellacci, 2008). The transition where companies take the strategic choice to add value to their products by adding services is known as servitization (Spring & Araujo, 2013) (Laine, Paranko, & Suomala, 2012) (Castellacci, 2008). The term servitization in the context of manufacturing operations is first defined by Vandermerwe and Rada (1988) as "*the increased offering of fuller market packages or 'bundles' of customer focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings*" (Vandermerwe & Rada, 1988). Servitization is the innovation of organizational capabilities and processes to create value through a shift from selling products to selling services (Baines, Lightfoot, Benedettini, & Kay, 2009). In recent years this transition to services (servitization) is enforced by the rapid developments in ICT that enable companies to develop web-based services (Akram, 2012). Generally there can be identified three factors that drive companies to the transition to services: financial (economics), strategic (competition) and marketing (customer demand) (Baines, Lightfoot, Benedettini, & Kay, 2009) (Oliva & Kallenberg, 2003). Especially companies with a high installed product base are moving to service offerings due to increased life cycles. Manufacturers that offer products characterized by complexity, technological innovation and customization have the potential to profit from the transition to services through the entire value chain (Lay, Copani, Jager, & Biege, 2010). But the design of services is significantly different from products because services are by nature difficult to define due to intangibility. Services challenge the conventional ways of thinking in the capital goods industry (Fisher, Gebauer, Gregory, Ren, & Fleisch, 2010). For the transition to services, the following potential benefits are identified: counter cyclical characteristics (steadier cash flows) and the opportunity to increase profitability by enhancing customer value and providing insights in customer's needs and strategic differentiation by gaining a competitive force to compensate commoditization (Matthyssens & Vandenbempt, 2010)(Baines, Lightfoot, Benedettini, & Kay, 2009) (Fisher, Gebauer, Gregory, Ren, & Fleisch, 2010) (Laine, Paranko, & Suomala, 2012) (Cavalieri & Pezzotta, 2012). Furthermore the bundling of good and services can erect barriers to entry, non-ownership benefits for customers and environmental sustainability (Schmenner, 2009) (Baines, Lightfoot, Benedettini, & Kay, 2009). But a shift to services does not guarantee success. The hurdles that need to be overcome by the company are related to believe in the economic potential, offering services may beyond the scope and the deployment of a successful service strategy (Oliva & Kallenberg,

2003). Therefore the transition to services is a long process, and companies are not always able to extract benefits from service strategies (Lay, Copani, Jager, & Biege, 2010). This so called service paradox is identified as companies who have expanded their service offerings do not achieve the expected revenue growth (Matthyssens & Vandenbempt, 2010) (Spring & Araujo, 2013). Currently the vast majority of companies is already offering services to some extent, but the revenues resulting from these services is still low. Due to the fact that service strategies are not fully developed, price bundling is not completely incorporated and a lack of company commitment (Lay, Copani, Jager, & Biege, 2010).

Solutions cover the extension of product and service components to the operational and business needs of customers (Gebauer, Paiola, & Saccani, 2013). Especially industrial, production-oriented companies are recognizing that margins in services can be high compared to products. Furthermore combinations of products and services can increase customer loyalty by selling a solution (Evanschitzky, Wangenheim, & Woisetschlager, 2011). Companies are moving down the value system, with an increased focus on end-users to gain a competitive advantage. This transition is needed due to the better bargaining bases of customers, higher demand for services and customization and increased receptiveness to technology (Vandermerwe & Rada, 1988).

2.2.2 Product-Service System

As servitization is a term used in scientific articles on business and management originating mainly from the USA and UK, Product-Service System (PSS) is a function-oriented business model that originates especially from West-European literature on sustainablity (Baines, et al., 2009) (Baines, Lightfoot, Benedettini, & Kay, 2009) (Cavalieri & Pezzotta, 2012). PSS is considered valuable to describe the transition from an industrial economy towards a functional economy via system innovations in which products are means to provide functions (Ceschin, 2013). Wiesner et al. (2013) state that servitization is affecting manufacturing companies to move to PSS (Wiesner, Peruzzini, Doumeingts, & Thoben, 2013). A PSS is described as ''*a system of products, services, supporting networks and infrastructure that is designed to be: competitive, satisfy customer needs and have a lower environmental impact than traditional business models*'' (Mont, 2002). A PSS is an integrated combination of products and services that delivers value in use by decoupling economic success from material consumption, see Figure 4 (Baines, et al., 2007) (Morelli, 2003). "*Rather than the traditional forms of sales, ownership, consume and disposal of cars, a PSS innovation is focused on delivering a particular satisfaction, in this case a service of "access to mobility". This satisfaction is delivered through a mix of products (mostly owned by producers) and services*" (Vezzoli & Ceschin, 2008).

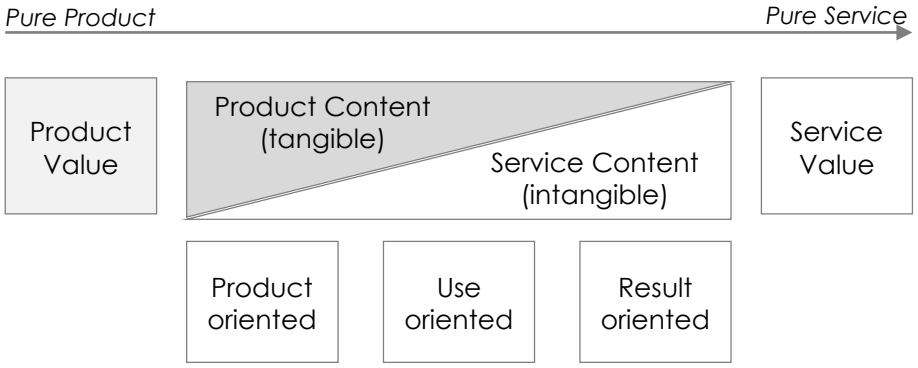


Figure 4: Categories in Product-Service Systems (Tukker, 2004)

It is a market proposition that expands the standard functionality of a product by adding services. To enhance the transition from sale of product to sale of use, by focusing on utilization rather than ownership. The user pays for the asset rather than the purchase, in this way risks, responsibilities and costs are restructured (Baines, et al., 2007). The key elements of a PSS are (Goedkoop, 1999): the Product (a tangible commodity manufactured to be sold, fulfilling user's needs), the Service (an activity done for others with an economic value, intangible) and the System (a collection of elements and their relations referring to the system of products and services delivered to the customer and the system of actors involved). The PSS includes all actors that could provide support and protection using a broader system approach (Baines, et al., 2009). Within a Use or Result-oriented PSS business model, a product still forms the basis of the relationship between the producer and user. But instead of purchasing the product the consumer leases it or buys the output of the product, depending on the desired level of use (Tukker, 2004). Several types of PSS can be identified in relation to the automotive industry, divided into Product, Use and Result oriented PSS, see Table 1. For a detailed description of the PSS and automotive examples, see Appendix B.

Table 1: types of PSS (Tukker, 2004) (Williams, 2007)

Type of PSS	
Product oriented	Product related services
	Advice & consultancy
Use oriented	Product lease
	Product sharing or renting
	Product pooling
Result oriented	Activity management/outsourcing
	Pay per service unit
	Functional result

2.2.3 Extended Products

The product centric perspective of looking at the transition to services is elaborated on in the concept of Extended Products (EP). The concept is introduced by Thoben et al. (2003) and delivers a model to describe the resulting PSS and visualizes the levels of servitization (Wiesner, Peruzzini, Doumeingts, & Thoben, 2013) (Thoben, Eschenbacher, & Jagdev, 2003). The following aspects define the EP concept: the combination of tangible product and intangible extensions, the intangible extensions (services) are information and knowledge intensive and collaboration of enterprises in networks is required to provide the EP package (Wiesner, Peruzzini, Doumeingts, & Thoben, 2013).

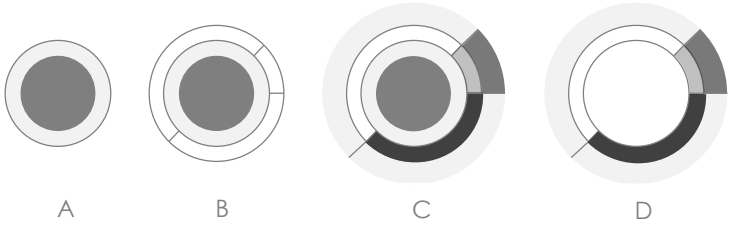


Figure 5: Levels of the Extended Product (Wiesner, Peruzzini, Doumeingts, & Thoben, 2013)

The Extended Product model contains four layers, resembling four levels of transition to services (servitization), see Figure 5 and Table 2. Level A is the lowest level of services, containing the core product and its product shell. Differentiation is established through product functionalities, pricing and quality. Level B and C describe the product + service scenario where the tangible product is supported by a service. Central in level B is the tangible product bought by the customer, services

are supportive and rather used as a marketing instrument. Level C elaborates on the services offering by continuous innovation the services differentiate the solution. Therefore a competitive advantage is created through services, but these are still charged separately from the product, aimed at individual customer requirements. The highest level of the transition to services is level D, using a product2service scenario the product and service development are bundled by offering a complete solution. The product is still required but merely used to provide the service, the revenues come from selling the service. Other options for new value propositions are new combinations of existing product with existing services, new services for existing products, new products for existing services or a combination of new products with new services (Wiesner, Winkler, Eschenbächer, & Thoben, 2013).

Table 2: The EP layer model (Wiesner, Peruzzini, Doumeingts, & Thoben, 2013)

Level of servitization		Layer of EP	Description
A	**Tangible product**	Core product	The physical product which is offered at the market, containing the core functionality of the market (e.g. functional parts of a car).
		Product shell	Features that describe the tangible packaging of the product, like painting or shape. Which can be different but still offer the same core functionality
B	**Product + supporting services**	Supporting services	Intangible additions, facilitating the use of the product like maintenance plans, mobility guarantees.
C	**Product + differentiating services**	Differentiating services	The outer layer, enabling individualization of the EP on the market like coding of personalized functionalities
D	**Product as a Service (PaaS)**	Service is core	Moving to a Service-dominant logic. with a focus on usage instead of ownership

Concluding remarks

This paragraph introduced *services* and the concepts that are relevant to indicate *the transition to services*. The *Product-Service System* and the *Extend Product* typology can be combined in a matrix. The resulting matrix describes whether the layer of the *Extended Product* is Product oriented, Use oriented or Service oriented. This matrix can be used to identify in detail the type of service and the layer of the *Extended Product* of a company, see Table 3. Combined with a graph that shows the transition to services over time, this matrix provides an integrated tool to identify the *transition to services*. Furthermore the core *value* creating *services* of companies can be identified and compared.

Table 3: EP/PSS Services Matrix

		Product Content / Service Content	Tangible Product	Support Services	Differentiating Services	Product as a Service
Product	Product related services					
	Advice and consultancy					
Use	Product lease					
	Product renting/sharing					
	Product pooling					
Result	Activity management					
	Pay per service unit					
	Functional result					

2.3 Industry Organization

The industry organization can be analyzed with several scientific approaches. This paragraph defines the approach that fits the research best. A first distinction between the approaches can be made based on the point of departure for the analysis, making a division in atomistic (bottom up, company centric) and relational approaches (top down, network centric), see Figure 6.

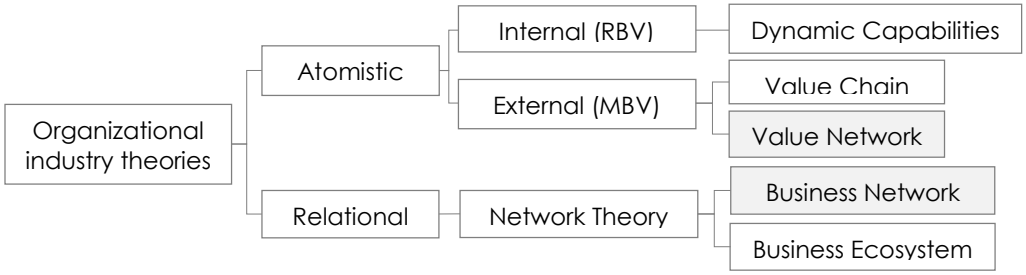


Figure 6: Division of theories and concepts on industry structures

The atomistic approach is employed by strategy scholars and focuses on the company to identify the competitive advantage, here the company is the unit of analysis. These scholars focus on how environmental factors affect the strategic behavior of the focal company. Therefore they make a distinction between internal and external factors on how a company can attain competitive advantages. Factors originating from the internal environment of the company are organizational culture, company culture and financial resources. These scholars use a Resource-Based view (RBV). The RBV suggests that the capabilities and resources of a company are linked to long-term competitive advantage. The RBV literature focuses on value appropriation and sustainability of competitive advantage, the dynamic capabilities approach is based on this theory which explores how valuable resource positions are built and acquired over time, see Appendix C (Teece, Pisano, & Shuen, 1997). The approach using an external orientation is the Market-Based view (MBV). The MBV is used to analyze the market environment and the competitive position in its environment. The MBV originates from the value chain developed by Porter (Porter, 1985).

Another line of reasoning on the organization of industries is established in network theories, based on the relational approach. Opposite to the atomistic approach the relational approach is based on social network theory were the role and position of a company in the network is central, hence the network is the unit of analysis. Industries are getting increasingly networked due to technological developments in ICT, globalization and market structures, resulting in a so called "Networked Economy" (Riemer, Klein, & Selz, 2001). Social network theory focusses on an in-depth analysis of relationships between companies within a network. A network is characterized by a broader vision, the absence of traditional hierarchies, the recognition of social networks and coordination through interactions of the companies involved (Lapiedra, Alegre, & Chiva, 2004). In general a network is built upon a set of relationships, interactions and interdependencies between actors (Jüttner & Schlange, 1996). Also the alliance degree is an important network characteristic because it refers to direct and indirect network ties and the attractiveness of the network. Networks do not evolve by themselves but are driven by the strategic adjustments like alliances. Networks are characterized by network size, diversity, structure and density. Consisting of nodes (positions) which are connect through interactions: links (relationships) (Ojasalo, 2004). Networks are dynamic due to the changes in actors, relationships, needs, problems and capabilities (Ojasalo, 2004). The relationships are mostly characterized by a relative evolutionary stability due to the longevity specificity of each relationship, which leads to a preference of actors as business

partners (Kamp, 2005). Also competitiveness and complementarity play a crucial role among the actors in the network. It is not possible to define the boundaries of a network exactly (Ojasalo, 2004). There are several different research approaches and perspectives to networks: industrial economics, organizational negotiation analysis, social networks and population ecology (Ojasalo, 2004). The development of networks of companies has enhanced the range of organizational arrangements for value creation (Amit & Zott, 2001). Strategic network theory and network analysis (network density, network externalities and centrality) only partially explain the potential of value creation (Amit & Zott, 2001). There are several different research approaches and perspectives to relational networks: industrial economics, organizational negotiation analysis, social networks, relational marketing and population ecology (Ojasalo, 2004). The concepts related to network theory that are gaining increasing attention in recent years are business networks and business ecosystems, see Figure 6.

The most relevant approaches identified in Figure 6 are analyzed and discussed in the following paragraphs. The Resource-Based view was found not to fit the research project. The RBV, with its related research on dynamic capabilities, is a valuable approach to gain insights in the competitive advantage of a company, see Appendix C. But the internal factors are found not to be essential to provide insights in the transition to services in the automotive industry. Furthermore, in this research project the companies investigated are not perceived as a bundle of resources. Thus, the RBV is not found essential to answer the main research question. Also the theory on business ecosystems is found to be not suited for this research project, see Appendix D. The major Drawback of Business Ecosystems theory is that the concept is not widely recognized or established in leading journals. Furthermore there is a lack of analytical tools for modelling or fore sighting of the business ecosystem in practice (Anggraeni, den Hartigh, & Zegveld, 2007).

2.3.1 Business Network Theory

The business network is a set of connected *actors*, in which each exchange *relation* is between business companies performing activities that *interact* with each other and have different *roles* (Ojasalo, 2004) (Kamp, 2005) (Hakansson & Ford, 2002) (Hakansson & Snehota, 1995). Business networking is the deliberate attempts of an actor to change the structure or process of interactions within relationships it operates (Ford & Mouzas, 2013). It intervenes with the continuing and complex interactions between a changing combination of *actors* within several *relationships* and *interdependencies*. Business interactions are embedded in a larger environment of multiple actors with direct and indirect influences on the focal company (Henneberg, Gruber, & Naudé, 2013). Therefore the business network has become an important concept explaining connectivity and interdependence (Henneberg, Gruber, & Naudé, 2013). Business networks are not bound to a specific service offering but comprise a set of related actors. The boundary of the network is not strict as well. Business networks are considered as groups of companies, cooperating, delivering and producing products and services. Furthermore, business networks are gaining increasing interest as a means to adapt to the changing environment. The focus is moving from an *organizational level* to an *inter-organizational level* (Tewoldeberhan, 2005). This perspective is influenced by business trends as outsourcing of secondary activities, focus on core competencies to reduce costs and globalization. But also due to new competition, technological developments and maturing of network analysis in the academic world. Companies form relationships with other organizations to combine their competences to create products of services. Furthermore, due to global competition, market deregulation, customer bargaining power, environmental protection issues and rapid technological development companies are changing their business to become more dynamic (Tewoldeberhan, 2005). This has resulted in an increased interest in networks, moving from the traditional large hierarchical company to a network of lateral and horizontal

linkages between companies. Business networks provide a disaggregated, distributed and flexible business, especially supported by the developments in information technologies (IT). These developments enable coordination and maintenance of relationships with more partners at much lower costs, resulting in innovation and higher efficiency through increased cooperation (Tewoldeberhan, 2005). Through these strategic business networks a company can get access to information, resources, technologies and markets, can gain advantages from learning and economies of scale and scope, and fulfill strategic objective like outsourcing and risk sharing (Gulati, Nohria, & Zaheer, 2000). Companies are embedded in a network of inter-organizational relationships with customers, suppliers and competitors. Many phenomena in business networks can only be understood when taking the relationships of companies into consideration, mapped in a network (Ritter, 2000). From a snapshot perspective networks always seem to be stable. But over time many changes may occur in relationships among actors in these networks (Freytag & Ritter, 2005) (Ritter, 2000).

2.3.2 Market-Based view

The market-based view has an external, outbound focus. External environmental factors include economic, political, social and technological factors that come from the external environment of the focal company and its network. The traditional hierarchical value chain applies to production industries as the value network applies to service industries (Stabell & Fjeldstad, 1998). The value chain and value network concepts elaborated in this paragraph are strongly linked to the work by Womack and Jones on Value Streams and to French scholars on the Filière, which is more commonly applied to the domestic value chain (Kaplinsky & Morris, 2002). The market-based line of reasoning states that especially in the service segments of an industry's value system the competitive forces are much weaker due to the specific characteristics of services (Kessler & Stephan, 2010). Due to the fact that services are customer specific and feature more intangible components than physical products. Furthermore information asymmetry creates customer loyalty, switching costs and barriers to change a service provider (Kessler & Stephan, 2010). Therefore service differentiation can foster new growth potential for product bound industries like the mature automotive industry. Interesting to see what types of advantages industrial companies can realize over pure service providers when they diversify into Extended Product services (Kessler & Stephan, 2010).

Value Chain

A well know concept strongly related to the market-based view is the Value Chain framework introduced by Porter in 1985 (Porter, 1985). The value chain framework is widely used to strategically analyze the logic of value creation on a company level (Porter, 1985) (Peppard & Rylander, 2006). It is a system of interdependent activities which are connected through linkages (Porter & Millar, 1985). The model focuses on the exchange of tangible assets including external, human and structural capital and assumes a linear structure. The chain categorizes the generic value-adding activities of an organization, showing total value and consists of value activities and margin (Porter, 1985). Value is created by transforming inputs into a product. According to Porter (1991) the value chain provides "*a template for understanding cost position because activities are the elemental unit of cost behavior*" (Porter, 1991). The value chain provides a means to systematically understand the sources of buyer value and hence differentiation. According to Porter (1991) "*Buyer value is created when a firm lowers its buyers cost or enhances its buyer's performance*" (Porter, 1991). The value chain is the set of linked activities performed by a company that impacts its competitiveness, consisting of primary and secondary activities. These linkages not only connect value activities within a company but also connect value chains between companies. This means that the value of a company can also be influenced by its

strategic partners (e.g. suppliers). What the key activities are to create a company's competitive advantage differs per industry. The generic primary activities have a sequential nature and are directly linked to the product, the support activities have a layered nature and are not uniquely linked to the value creation logic of a technology, see Figure 7. The assembly line-based automotive manufacturing is considered as an example of long-linked value creation technology and can be well described by a value chain analysis (Stabell & Fjeldstad, 1998). Therefore Value Chain framework is found to be merely based on manufacturing industries and potentially merely suited to indicate the upstream activities within the automotive industry.

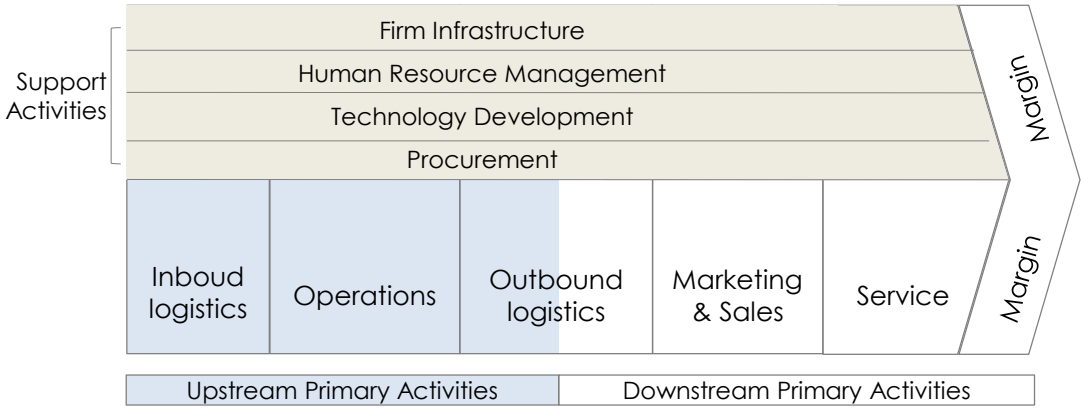


Figure 7: The Value Chain (Porter, 1985) (Porter, 1986).

Although the value chain concept is traditionally used for the analysis of an individual company, nowadays it can also be used to describe a complete industry. The intra-link value chain is translated to the entire industry chain, were every activity can be fulfilled by a separate company (Kaplinsky & Morris, 2002). When multiple companies are cooperating to produce a product or service the value chain is extended and called the value system (Porter, 1985). After the focal company has created the product, the product passes through the value chains of distributors, taking into account that individual companies are embedded in a large stream of activities (Wells, 2010). So value is added sequentially by actors, therefore the value system consists of several value chains, e.g. supplier value chains (who create and deliver the essential inputs to the company's own chain), the channel value chain (delivery mechanisms for the industry products on their way to the end buyer customer or consumer) and buyers value chain (the ultimate source of differentiation because it is the products role in this system that determines the buyers need) see Figure 8 (Kaplinsky & Morris, 2002) (Wells, 2010).

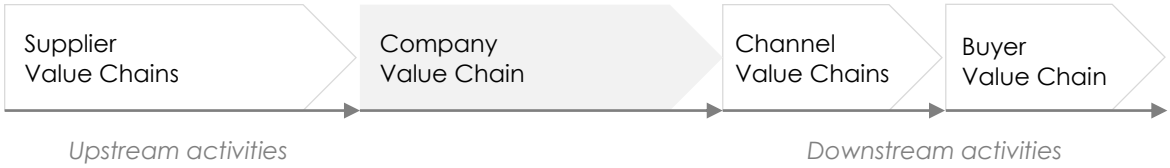


Figure 8: The Value System (Porter & Millar, 1985) (Porter, 1991)

Value Network

The value network is evolved out of the value chain model and shows a strong connection to business network theory. The value network was developed due to critique by various researchers on the value chain model. The value chain framework is considered less applicable to service industries due to the fact that the primary activity typology of a value chain analysis is less suitable to the analysis of service related activities (Stabell & Fjeldstad, 1998)(Armistead & Clark, 1993). Value chain analysis directs too much attention to unit costs (Stabell & Fjeldstad, 1998). As products and services become dematerialized, the value chain itself does not have a physical dimension making it an inappropriate concept to use in industries less focused on the exchange of tangible assets (Peppard & Rylander, 2006) (Allee, 2000). Finally, the value chain model implies a linear industry structure, which nowadays is not representative, especially not for service oriented industries. The aspect of sequential contributions to the final product is what differentiates the value chain from the value network, where interactions can be parallel and reciprocal. Peppard and Rylander suggest to describe service type industries in terms of value networks (Peppard & Rylander, 2006). This approach shows clear parallels to the maps of business networks as introduced by Ritter (2000). In this thesis the focus lies on a focal company active in the downstream service activities of the automotive industry and its value networks built around their service offerings. Therefore, focusing on a network where value is co-created by a combination of actors is suited, see Figure 9. For every actor its relation to the service in the value network is indicated. Instead of focusing on the organizing activities within the boundaries of the company, the value network concept highlights the significance of relationships between the companies involved.

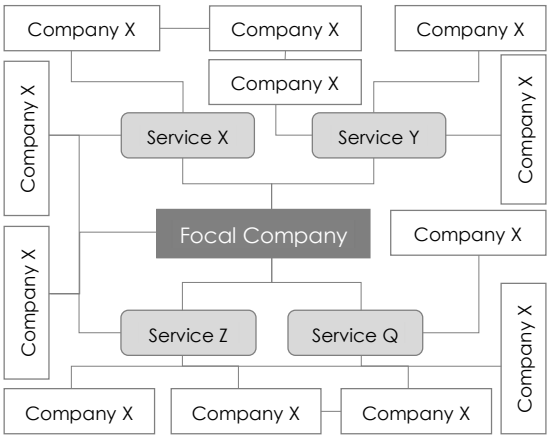


Figure 9: Conceptual view of a Value Network

Stabell and Fjeldstad (1998) define value networks as "*companies that can be modelled as value networks rely on a mediating technology to link clients or customers who are or wish to be interdependent*" (Stabell & Fjeldstad, 1998). Elaborating on this definition, Peppard and Rylander define value networks as "*a set of relatively autonomous units that can be managed independently, but operate together in a framework of common principles and service level agreements*" (Peppard & Rylander, 2006). For this research the value network is found best to be defined as "*a dynamic network of actors working together to generate customer value and network value by means of a specific service offering, in which tangible and intangible value is exchanged between the actors involved*" (de Reuver, 2009). The value-creating networks take businesses into a competitive domain where competition will shift from the company level to the network level (Kothandaraman & Wilson, 2001). The value-creating networks take businesses into a competitive domain where competition will shift from the company level to the network level (Kothandaraman & Wilson, 2001). Some authors denote a central actor, the focal company, providing the mediation technology used to connect customers and admitting actors to the network that complement or exclude others (Stabell & Fjeldstad, 1998). Value networks are composed of complementary node and links, the focus lies on the value-creating system itself, within which different actors as suppliers, partners and customers work together to co-produce

value (Peppard & Rylander, 2006). The companies in the network are independent, however the relationships of the companies are essential to their competitive position.

Parallel to business networks, value networks can be described in terms of *actors* (commercial entity in the market place fulfilling one or more roles in the value network) *roles* (a specific value adding activity in the value network) and *relationships* (the expression of interaction between roles or actors in the value network). By looking at the value creation process of a service an overview can be established of how the roles are divided for different configurations of services. End customers are typically the key to value creation in the value network. Modelling a value network in a single model is hard due to the complexity embedded in a network, therefore it is important to remain on a high level of aggregation. The visualization of the relations between the companies can be established using the unified modelling language (UML) building blocks. These techniques can provide a transparent overview at the value network level. As the amount of actors involved in the value network can be very high, the actors are segmented according to their predominant role in the network. The Value Network is designed to identify the service portfolio of a company and the value creating network of strategic partners. The Network Value Analysis (NVA) is a method to analyze the value network in a systematic manner, originally developed for the mobile services industry by Peppard and Rylander, see Table 4. Crucial to this analysis is an in-depth understanding of the value dimensions of all actors and how they are influenced by other actors. They also define the limits to this analysis: a map is by definition static (a snap shot) whereas the environment, and in particular in a network is dynamic. The NVA is found to be a valuable framework to identify the value network of the downstream activities in the automotive industry. But the NVA is currently limited in its operationalization, therefore in the methodology, chapter 3, an operationalization is discussed to fit this research project.

Table 4: Network Value Analysis (Peppard & Rylander, 2006).

NVA Steps	
1	**Define the network**
	Setting the boundaries of analysis from the perspective of the focal company in the network.
2	**Identify and define network actors**
	Identifying all actors that directly influence the value the network focal delivers to its end-customers
3	**Define value perceived by actors**
	Capture the perceived value of each network member. Assess the forces that are shaping such networks
4	**Identify and map network influences**
	Define value linkages in the network. Influences (direct or indirect) are a manifestation of linkages between network members and concern what is exchanged in the network. Only those influences that have an explicit effect on the focal company business are considered. The types of influences can be divided into exchange of goods and services (A), affection and liking (B), information and ideas (C) and influence and power (D).
5	**Analyze and Shape**
	The network value map provides an overview of the network and thus allows conclusions to be drawn as it relates to the roles of the different participants in the network and analyze scenarios in terms of effects on the network of discrete events.

2.3.3 Comparison

Despite the amount of relational literature on networks and inter-organizational relationships, the research remains fragmented. The different pieces of theory do not fit together due to different backgrounds from which the relationships are addressed, different trends are followed and different methods are used (Ritter & Gemunden, 2003) (Anggraeni, den Hartigh, & Zegveld, 2007).

As a result many conceptual research on networks have not developed into an empirical investigation. Although the potential of the top-down relational theories is recognized, it seems that these concepts are not developed fully nor recognized by a wide range of scientific scholars. The few methods that are developed have several shortcomings: the lack of strategic focus or future perspective, the static analysis of a dynamic network, the neglect of interdependencies and potential of the network perspective (Battistella, Colucci, De Toni, & Nonino, 2013). Although these concepts largely ignore the concept of value creation and merely focus on relations, the visual potential of the theory is recognized. Therefore aspects of business network theory, related to connectivity and interdependence of the actors, are applied in mapping the value networks. Furthermore value networks adopted in this research are, like business networks, not bound to a specific service offering but comprise a set of connected actors. The boundary of the network is not strict as well. For this research the networks are considered as groups of companies, which cooperate to offer services.

Vanhaverbeke and Cloodt (2006) argue that the combination of *Value Chain analysis*, *network theory* and the *Resource-based view* (RBV) are useful in explaining *value* constellations but their analysis shows that an integration is needed of these various frameworks to come up with a complete picture (Vanhaverbeke & Cloodt, 2006). Amit and Zott come to the same conclusion in their study about e-business models (Amit & Zott, 2001). Currently a closed theory of neither services nor service innovations does exist, therefore the MBV is motivated as an adequate theoretic reference point (Dirlenbach, 2008) (Sampson & Froehle, 2006). This atomistic approach is found to be suited for the research project because it is well established in scientific literature and provides solid analytical methods for research. Since the transition to services is analyzed, taking the company as a unit of analysis is found to be a perspective that would fit the research. The MBV approach, analyzing the value system (the network and chain), is considered to fit the research subject on value creation. Because the research is aimed at identifying the changes within the automotive industry taking into account competitors and complementors, the external, market-based view is considered to be a valid approach, see paragraph 2.3.2. Moreover it is expected that the value creation structure will change considerably due to service innovations. To identify the value creation structure the Value System framework is used. But rather than consisting of solely value chains, value network configurations are included as well. Therefore a link is made between the market-based view and business network theory of paragraph 2.3.1, see Figure 6. The Value Network shows overlap with business network theory, approaching the downstream activities in the automotive industry as a network provides a disaggregated, distributed and flexible business which is aimed more at service oriented business. It requires a transition to a collaborative and dynamic nature of the industry's actors (Wiesner, Peruzzini, Doumeingts, & Thoben, 2013). Companies should extend their traditional vertically integrated supplier-customer relationship with a *service network*, which enables the provision of services that are important for the solution offering (Gebauer, Paiola, & Saccani, 2013).

2.4 Hypotheses

The theoretical discussion in previous paragraphs identified a gap in literature on the transition to services. The concepts on *Extended Product*, *Product-Service Systems* and *Network Value Analysis* form a base to explore new discoveries in the field. Due to the newness of the concepts related to the *transition to services*, they call for further empirical testing to improve their validity. As

identified in the theory of previous paragraphs, *transition to services* is a relatively ill explored field of study without consolidated perspectives and theories. As a result the literature is fragmented and requires an integrated model to gain adequate understanding. The hypotheses posed in this paragraph prove to be an explanation of phenomenon identified in the literature review. According to Bryman, a hypothesis is defined as "*an informed speculation, which is set up to be tested, about the possible relationship between two or more variables*" (Bryman, 2012). Hypotheses are developed to test whether relations between the variables of the conceptual framework are existent. The moderating effect of the *transition to services* on the direct relation between the *value system* and *EP/PSS* is identified. Followed by the direct influence of the introduction of the *EP/PSS* on an *extended, networked value system*. Case studies will be developed to test these hypotheses.

The first two hypotheses concern the *value creation* and the *transition to services* in the downstream activities of the automotive industry. Hypothesis 1 relates the constructs of *value* and *differentiation into services,* to the *downstream activities* in the FMC case.

Hypothesis 1: *Increasingly value is added by downstream activities of fleet management companies in the automotive industry due to differentiation into services.*

The second hypothesis investigates similar constructs but applies it to the other case. This hypothesis relates the constructs of *Extended Products*, *value creation* to the *transition to services* for the OEM case.

Hypothesis 2: *Extended Products are increasingly important for value creation in the downstream activities, as a result the OEM is increasingly focusing on services.*

The first two hypotheses provide a clear context of what is changing for two important actors in the downstream activities of the automotive industry, the FMC and the OEM. Based on the insights gained from previous hypotheses, the third and fourth hypotheses indicate the potential influence of this *transition to services* on the downstream *value system*. The *transition to services* is expected to influence the *inter-organizational relationships*. Because several service offerings may be beyond the capabilities of a single company or it may not be economically viable to master all the activities needed to provide services (Gebauer, Paiola, & Saccani, 2013). According to Wiesner et al. (2013). It requires a transition to a collaborative and dynamic nature of the industry's actors Therefore hypothesis 3 relates the construct of *new actors* to *new services*.

Hypothesis 3: *New actors enter the downstream activities of the automotive industry to increase value creation due to new services offerings.*

Companies should extend their traditional vertically integrated supplier-customer relationship with a *service network*, which enables the provision of services that are important for the solution offering (Gebauer, Paiola, & Saccani, 2013). In *service networks, value* is created by *cooperation of multiple actors* with different core competences that contain a collection of suppliers, downstream channels to markets and ancillary service providers (Gebauer, Paiola, & Saccani, 2013). Through networking companies can acquire new competences that drives the transition to services. A shift in the *value system* is often linked to *new services* because companies need to renew themselves and develop new strategies for service development (Henneberg, Gruber, & Naudé, 2013). Therefore, hypothesis 4 defines whether and how the *transition to services* influences the *value system* by relating the *transition to services* to the construct of *value network structure*.

Hypothesis 4: *Service transitions influence the value system structure of the automotive industry.*

In chapter 5 the two cases verifying of falsifying the hypotheses are introduced. The hypotheses are discussed and confirmed or falsified in chapter 6.

2.5 Conclusions

Following the literature review within this theoretical framework the research is mainly build on the concepts of *value networks* (part of a value system) and *transition to services*: *Product-Service Systems* (PSS) and *Extended Products* (EP). The analysis of *organizational industry theories* makes clear which direction is best for the nature of this research project. When the concepts from the atomistic and relational approach are compared it is clear that the atomistic concepts and methods of analysis are far better established in scientific literature. Since there is no model that completes the integration momentarily, the research is bound to focus on a part of the whole value creation process. Important to notice is that the distinction between the atomistic and relational approach has started to blur with the introduction of the *value network* concept. This concept originated from the atomistic *value chain*, with the company as the unit of analysis, and evolved into a partly relational approach, showing similarities with *business network theory*. Although the *Network Value Analysis* (NVA) does not capture the dynamics of a value *network*, it does provide a valuable overview of the *network*, its *structure* and *interdependencies*. The *transition to services* is expected to influence the *inter-organizational relationships*. Because several service offerings may be beyond the capabilities of a single company or it may not be economically viable to master all the activities needed to provide services. It requires a transition to a collaborative and dynamic nature of the industry's actors. Companies should extend their traditional vertically integrated supplier-customer relationship with a *service network*, which enables the provision of services that are important for the solution offering.

The conceptual framework is operationalized based on the literature review. The conceptual model is presented in broad terms in chapter 1, based on the literature review it is operationalized, see Figure 10. It connects the concepts defined in the literature review and, specifies the direction of the relationship between the concepts. The conceptual model maps the interdependencies of *value creation*, *industry organization* and *service transition*. The concepts in the conceptual model are defined based on the literature review.

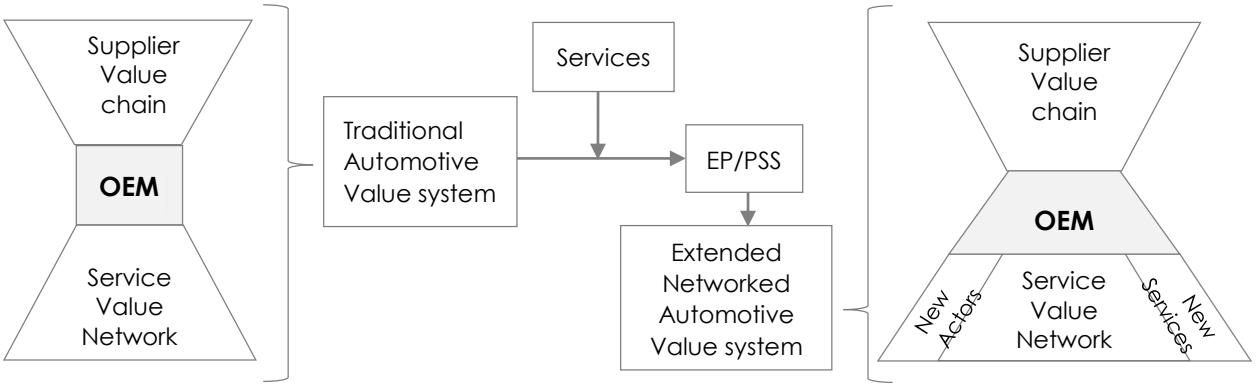


Figure 10: The Conceptual Model operationalized

Traditional Automotive Value system. The automotive industry consists of upstream activities and downstream activities with the OEM as focal company. Every actor in the complete value system adds value to the final product. The upstream activities are goods-oriented, related to production

on cars and components by suppliers in a supplier value chain. The downstream activities are service-oriented, more involved in final customer contact in a service value network. The focus of this research project lies on the service value network structure. The traditional automotive value system will be elaborated on in chapter 4.

Services. Transition to services is described by following the servitization definition of Vandermerwe & Rada (1988) "*the increased offering of fuller market packages or 'bundles' of customer focused combinations of goods, services, support, self-service and knowledge in order to add value to core product offerings*".

Extended Products/Product-Service System (EP/PSS). The Extended Products concept is strongly related to PSS and considered a valuable tool to visualize the product centric service transition for the automotive industry. Since cars are still found to be at the core of the OEMs in the automotive industry, the EP concept has the potential of explaining the services added to products and therefore the value added. PSS is found to be valuable to describe the service transition due to its detail and differentiated orientation of the service offer for service companies as fleet management companies. Both concepts are combined in a matrix to define the transition to services concepts is used in this research project, see Table 3.

Extended Networked Automotive Value system. Through networking companies can acquire new competences that drives the transition to services. To identify the influence on the transition to services on the value creation within the industry structure a NVA is proposed. This tool maps the value network of a focal company. This enables the exploration of how one company's products and services are integrated within another company, connecting the productive opportunities of these companies. Therefore the NVA by Peppard and Rylander is found to be the best fit to analyze the value creation structure of downstream activities.

3 Methodology

This chapter describes the research methodology used for the research project, including data collection tools. Furthermore it elaborates on the details of the multiple case study research design. The research design follows the conceptual model of chapter 1 and the theoretical framework of chapter 2. This research design was chosen because of its empirical nature and since it was based on in-depth qualitative research. Furthermore the research design facilitated the possibility of data collection within the context, balancing the data available and realization of the research objectives both theoretical and practical. The inductive principles were central to the research (Bryman, 2012).

The research strategy, defined as a general orientation to the conduct of social research, has a qualitative nature. Since the transition to services in the automotive industry was investigated using a market-based view over time, the qualitative strategy was found to fit the main research question. Merely due to the type of knowledge that this methodology generates and the ability to gain in-depth and holistic insights into a process or object that is confined to a particular context (Verschuren & Doorewaard, 2010). Furthermore, considering the complex nature of the transition to services evidenced in the literature, this method was favorable to the object of this research: obtaining the structural change in the automotive industry. The exploratory nature of the research fits the immaturity of the concepts on services. To enhance the validity and reliability of the research it is important to be aware of the limitations of qualitative research, which are related to (Bryman, 2012) (Yin, 2009): subjectivity, difficulty to replicate, problems of generalization and the lack of transparency. In the research design these limitations were taken into account and minimized as much as possible by using a protocol. The qualitative research strategy for this research project contains a case study research design, consisting of two cases, which is elaborated on in paragraph 3.1. The next paragraph handles the data collection plan, followed by the data analysis in paragraph 3.3. The case study protocol is presented in paragraph 3.4 and the chapter is ended with quality considerations in paragraph 3.5.

3.1 Research Design

The research was built around a case study research design including a longitudinal element by identifying the past, present and future of services in the automotive industry (Yin, 2009) (Bryman, 2012). The case study is a detailed account of a subject in which the researcher gains a profound and full insight into several processes that are confined in time and space (Verschuren & Doorewaard, 2010). A holistic multiple-case study design was used since the research aims to analyze contemporary phenomena in their real-life setting, taking into account the rich qualitative complexities (Yin, 2009). The multiple-case study design became the overarching framework of research that consists of several related investigations (Mills, Durepos, & Wiebe, 2010). The two case studies were investigated to examine the structure of the companies analyzed. Therefore the holistic approach was advantageous over embedded because the market-based value network theory underlining the case study itself is of a holistic nature. The limit of using the holistic case study approach lies in the danger of conducting the case study at an unduly, abstract level, lacking sufficiently clear measures or data. The multiple case design was chosen because its evidence is often considered more compelling and therefore the study is found to be more robust. The characteristics of case study research design are: the small number of research units, intensive data generation, focus on depth, a selective sample, holistic, open investigation and qualitative data and research methods (Verschuren & Doorewaard, 2010).

A typical form of a qualitative content analysis was used, analyzing archival records, documents relating to different time periods and the use of semi-structured expert interviews (Bryman, 2012). Through literature reviews new insights were gained in the development of services in the automotive industry. The semi-structured interviews were used to gain insights in how the increasing attention to services has influenced the value creation among the actors in the automotive industry in the past and will do in the future. Due to time constrains, the automotive industry was found to be too broad to capture completely in case studies. Therefore the companies for the two cases were selected based on the quasi-natural experimental setup to provide insights in the value creation of downstream activities. The quasi-natural experiment design was chosen since its setup is useful in generating results for general trends. The absence of random assignment of cases in the research did affect the interval validity as did the fact that there is no control group (Bryman, 2012). Since the quasi-natural experiment does not exhibit complete internal validity it does not meet the requirements needed to be an experiment. But it was suggested that it is possible to strengthen causal inferences and the results could be compelling since no interventions were made (Grant & Wall, 2009). The companies in the cases were selected based on their context, they are expected to respond differently due to the difference in their core business. All companies investigated provide a flagship role in the industry which is based on their market presence, their innovativeness or their perceived focus on services, see chapter 5. The usage of case studies offered the possibility to gain a general picture of the research object. Furthermore not much pre-structuring was required which makes it easier to change course. Case study research is complicated and ambiguous when studying organizational networks. This is due to the fact that network boundaries are arbitrary, their embedded complexity, the high number of actors involved, the difficulty of taking into account the dimension of time and finally due to comparing cases, since each case is unique (Halinen & Tornroos, 2005). These issues could be resolved to a large extend by providing insights in the line of reasoning by the researcher. Therefore the decisions made are discussed in the research protocol, see paragraph 3.4.

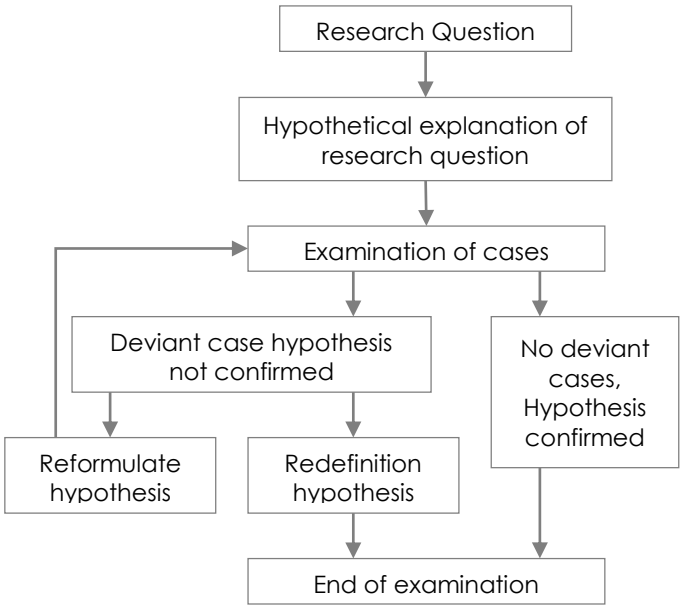
3.2 Data collection

The data collection methods used in this research project were desk research (documents & archival records) and interviews. Documentation is a stable source of evidence and was partly used to verify the findings from the interviews. Because of their overall value, documents play an important role in the data collection plan. The use of archival records is very comparable to the document source of evidence. When archival records are used the accuracy as well as the condition under which the records are produced are important. Figure 11 provides an overview of the data collection methods used for the period in time to analyze the automotive industry. The use of interviews is traditionally an important source of evidence for case study research. Interviews were merely used to identify the current situation and future transitions. It enabled the researcher to find opinions, non-documented or sensitive information. In this case, semi-structured focused interviews were held with open-ended questions to gain in-depth knowledge. The person was interviewed for about 45-60 minutes, and a set of questions was merely followed as listed in the interview protocol, see Appendix E. It was found not feasible to conduct all interviews face-to face, since interviewees from multiple countries were interviewed. Therefore some interviews were conducted via phone or video conferencing. To overcome the drawbacks of non-face-to-face meetings as much as possible, the interviewees were informed as much as possible in advance. This was done by sending the interviewees a topic list, a One Pager of the project and a preliminary value network map of their company. The outcomes of the literature review were used to structure the interviews. With the interviewee's permission, the interviews were recorded.

Figure 11: Data collection methods over time (past, present and future)

The narrative review approach was applied to the literature review in chapter 2 and 4. This approach is designed to be more wide-ranging in scope than systematic review and less explicit about the criteria for the exclusion or inclusion of studies (Bryman, 2012). The narrative review is thus a less predefined process of discovery, and therefore suited for this research project. Due to its emphasis on transparency some elements of the systematic review were also incorporated in the literature review. A systematic review has been defined as "*a replicable, scientific and transparent process, that aims to minimize bias through exhaustive literature searches of published and unpublished studies and by providing an audit trail of the reviewers decisions, procedures and conclusions*" (Tranfield, Denyer, & Smart, 2003). Due to the fact that the systematic review approach does contain elements which cannot be applied easily to this research project, a full systematic review approach is found to be redundant. Furthermore, due to the limited time and resources for this research available and the need for a second researcher, application of the systematic review was found to be impossible in a practical sense (Bryman, 2012). Important to notice is that literature review was seen as an ongoing process component throughout the whole research project. The principles of theoretical saturation had been applied throughout the literature review, stating that when there is no need to continue with data collection in relation to the category, hypotheses can be formed (Bryman, 2012). Theoretical saturation is defined as "*carry on sampling theoretically until no new relevant data seem to be emerging regarding a category, the category is well developed in terms of its properties and dimensions demonstrating variation and the relationships among categories are well established and validated*" (Strauss & Corbin, 1998).

3.3 Data analysis



The strategy used for the data analysis was analytic induction. This strategy is meant to guide the analysis of data. Analytic induction is "*the analysis of data in which the researcher seeks universal explanations of phenomena by pursuing the collection of data until no cases that are inconsistent with a hypothetical explanation of a phenomenon are found*" (Bryman, 2012). It began with the research question, which was proceeded by a hypothetical explanation of the problem addressed and then continued on to the collection of data (Bryman, 2012). The process of analytic induction is in practice focused on the interview transcriptions and documentation, see Figure 12.

Figure 12: the process of analytic induction (Bryman, 2012)

The data was first analyzed per company: transcriptions were printed and important quotations were highlighted by hand to get a clear overview of the topics associated with the interview transcriptions. Information relating to the value network of services was processed to outline the value networks per company. Next, the data was analyzed using Atlas TI 7, am extensive software tool used to structure the qualitative data analysis. The software was especially useful to collect the data transcripts, to structure the coding process, write memo's and analyze the data in a statistical manner. The software fostered the capabilities of the researcher to explore the underlying phenomena in the data. Furthermore the software enabled clear management of the data and codes and offered an advantage in maintaining a chain of evidence with the data sources. Therefore usage of Atlas TI definitely enhanced the construct validity of the research project to a large extend. A preliminary code list was developed but an open mind was kept for new coding opportunities, making sure that explanatory factors beyond the research questions and hypothesis were coded as well. After the coding of the individual interview transcriptions, data for the cases was formed by merging the transcriptions per company and per case (case OEM: BMW, and Case FMC: three fleet management companies). Overlapping *codes* were merged and *Super codes* were formed consisting of multiple codes. The Query tool in Atlas TI was used to query the quotations in a network model, to check whether the interpretations of the researcher were in fact supported by the qualitative data. Furthermore, interesting quotations were used in the case study to provide a thick description of the findings.

As proposed in chapter 2, for the cases the value creation is mapped per company using the Network Value Analysis. The Network Value Analysis (NVA) was proposed as a method to analyze the value network in a systematic manner in the case studies. In every step, different sources of evidence were used, see Table 5. The value networks were continuously created based on the feedback of the interviewees, see chapter 5. Based on the value network of Peppard and Rylander (2006) the maps provide an overview of the services offered by the focal company, the

central dark grey box. Furthermore the subsidiaries are in bold and medium grey, the (combined) services are indicated in light grey. The high level strategic partners associated with these services are stated in the blank boxes at the edge of the value network. Furthermore links are provided between the focal company their services and the strategic partners associated with these services. In some cases the subsidiaries were linked due to a strong internal dependence within the company. The value networks were shaped in a way that they form a box, indicating the rigid relation to the focal company. Furthermore the traditional services of the focal companies were grouped as much as possible in the same location of the maps. This is intended to enhance comparison between the value networks of the companies.

The interviews were not solely used to define the value perceived by the entities. But also to gain insights in how value will be added by the focal company and its strategic partners in the future, by shaping a complete picture on the vision of the interviewee. In every case the value network was defined for the current situation and the transition to services was mapped using the EP/PSS matrix, see Table 3. Not all aspects of the NVA were analyzed as much in depth as suggested by Peppard and Rylander. Merely because the main research question only asks how the transition to services changed the value creation, a detailed analysis of perceived value (step 3) was considered not critical for this research project.

Table 5: Operationalization of the NVA

NVA Steps		Main Source	Interview Questions
1	**Define the network**	**Documents & interviews**	What services are you offering and why? What new services are you planning to implement? Why are you moving to these new services?
	Setting the boundaries of analysis from the perspective of the focal company in the network.	The focal company is the company were interviews are held. A list is drawn of all its service offerings. The network boundary is set by direct links of the focal company with whom it provides services to its customers and its upstream partners (cooperation partners).	
2	**Identify and define network actors**	**Documents & interviews**	Who are your main competitors and is this expected to change in the future? With who are you cooperating to offer these services?
	Identifying all actors that directly influence the value the network focal delivers to its end-customers	The direct partners and competitors of the focal company are identified.	
3	**Define value perceived by actors**	**Interviews**	What are they getting out of the network? How is the value created?
	Capture the perceived value of each network member. Assess the forces that are shaping such networks	The focal company defines the value of each network member (this is not quantified) based on core capabilities, relationships and customer value (Kothandaraman & Wilson, 2001)	
4	**Identify and map network influences**	**Documents and interviews**	What is exchanged in the network? How would you describe the influences (direct or indirect) per network actor?
	Define value linkages in the network. Influences (direct or indirect) are a manifestation of linkages between network members and concern what is exchanged in the network. Only those influences that have an explicit effect on the focal company business are considered.	The interviewee defines the linkages with its network members. Combined with information from documents. Influences are a manifestation of linkages between network members and concern what flows in the network – that is, what is carried or exchanged in the network.	
5	**Analyze and Shape**	**Documents and interviews**	How would you map the relationships of your company?
	The network value map provides an overview of the network and thus allows conclusions to be drawn as it relates to the roles of the different participants in the network and analyze scenarios in terms of effects on the network of discrete events.	Mapping using a UML approach. Setting linkages between the actors in the network.	

Coding

A coding procedure was used in this research to categorize the data, this facilitated the systematic analysis. The selective coding procedure was applied by following Strauss & Corbin (2008). Following this procedure, a standard code list was developed prior to the data collection, see Appendix H. This list provided an initial set of relevant codes to verify or falsify the hypotheses posed in chapter 2. Although multiple codes were added afterwards, while analyzing the data, this initial set made sure that most relevant codes were included in the research. The analysis activities were aided by ATLAS TI, a specialized software tool for the analysis of qualitative data. In the analysis of the interview transcriptions the theoretical concepts were applied in the form of *codes* and the thoughts of the researcher were reported in *memos*. The software provided a structured approach to explore and organize the data, this enhanced the construct validity of the research. ATLAS TI has the capability to discover insights from the data such as the *groundedness* and the *density* of codes. The *groundedness* indicates the number of times a code appeared in the data. The *density* of the code defines the number of links logically associated with the code. Furthermore *network views* and *co-occurrence tables* visualize the relations between the codes. *Network views were used to* map the specific relations between the *codes* associated with the hypothesis. *Co-occurrence tables* were formed with the *co-occurrence explorer*, these tables show which *codes* co-occur in the margin area. Since a small data set (12 interviews) was used, coefficient measuring was not appropriate, therefore only the frequency of co-occurrence was stated in the tables. When the first line of data coding was completed the whole coding procedure was done again, enhancing quality and consistency of the coding list. It is important to notice that the numbers developed in the analysis were only valid for comparison. These numbers cannot be used to make claims about concepts on an individual basis. In order to provide a clearer description of the procedure followed during the coding phase a coding example is posed in Figure 13. The figure visualizes the result of the coding procedure for one quotation.

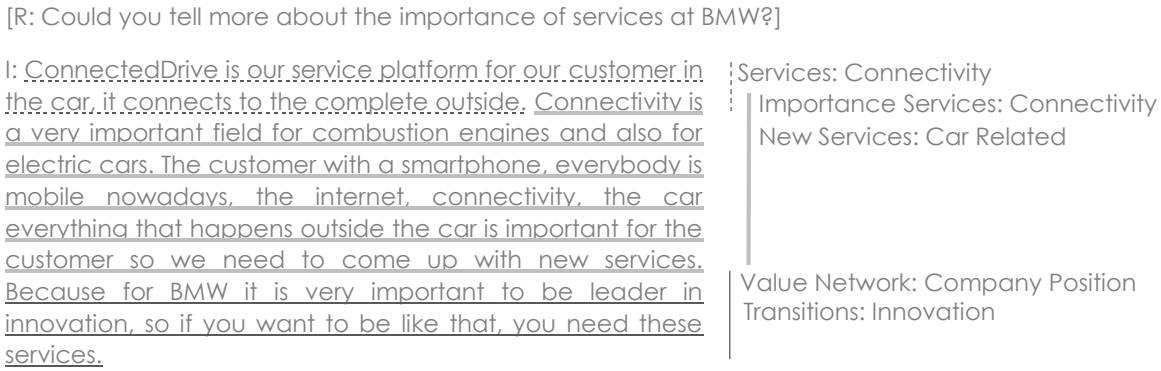


Figure 13: Coding Example

Inter-coder reliability

The inter-coder reliability was investigated to measure the extent of agreement between two researchers, coding independently the same transcriptions. The inter-coder reliability was measured to enhance internal validity of the research, see Appendix H. A second researcher was requested to code the first four interview transcriptions (a sample) again using the standard code list. The standard coding list consists of 45 codes, most code families contained an "others" code, indicating that new types could be identified and coded not known before. Code-by-code comparison showed the data content, offering a qualitative means of comparing coded data by coders. The coding list and quotations were adjusted to the findings of the codes in the transcriptions coded by the second coder. The researchers discussed on the discrepancies on points of improvement for the coding list. The second coder analysis showed a match of 66%, which was reasonable considering the discussion on trends and transitions. For example, after the discussion the code *Markets* was specified in 15 additional codes. Especially the codes and their associated quotations on *Transitions*, *Trends* and *Value Network* were discussed and specified due to the high degree of variation between the two coded sets. After clarification of the codes used both researchers agreed on the coding set and application of the codes in the first four transcriptions. Afterwards the remaining eight transcriptions were coded by only one researcher following the extended coding list of Table 6. In the end 122 codes were used in total, most of the time the "others" codes were specified, resulting in 68 new codes and 9 completely new codes were added based on the second coder analysis.

After the coding process, multiple overlapping codes were grouped in ten **Supercodes* (highlighted in grey), see Table 6. Supercodes are stored queries that typically consist of several combined codes. In order to sort, filter and organize the coding list in the code manager in ATLAS TI *Code Families* were developed to loosely group codes that belong together. This allowed to group the data per case and analysis a specific company. Table 7 provides an overview of the twelve code families, including associated codes and the number of quotations. In the data analysis, 693 times a code was applied to 329 quotations in 12 interview transcriptions (58 codings per interview transcription on average). See Appendix I for a network view of the super codes (10) and the co-occurrence of the super codes in the data.

Table 6: the complete Coding List

*Changing Value Network	Markets: Denmark	Reasons Mobility Services: Costs
*Cooperation	Markets: France	Reasons Mobility Services: Customer Demand
*Importance Services	Markets: Germany	Reasons Mobility Services: Environmental
*Integration	Markets: Leasing Services high	Reasons Transition: Legislation
*Markets	Markets: Maturity High	Services: Carsharing
*New Actors	Markets: Maturity Low	Services: Commodity
*New Services	Markets: Maturity Medium	Services: Connectivity
*Services	Markets: Mobility Services high	Services: Consultancy
*Transitions	Markets: Mobility Services low	Services: Financial
*Trends	Markets: the Netherlands	Services: Insurance
Cooperation: Customers	Markets: UK	Services: Leasing
Cooperation: Dealers	Markets: US	Services: Maintenance & Repair
Cooperation: increasing	Markets: Western Europe	Services: Mobility
Cooperation: Insurance Companies	New Actors: Building Companies	Transitions: B2B/B2C
Cooperation: Leasing Companies	New Actors: Competitors	Transitions: Collaborative Consumption
Cooperation: OEM	New Actors: Consultancy Companies	Transitions: Connectivity
Cooperation: Others	New Actors: Energy Companies	Transitions: Core Business
Cooperation: Public Transport Operators	New Actors: Financial Services	Transitions: Creating Awareness
Cooperation: Strategic Partners increasing	New Actors: Fleet Managers	Transitions: Customer Needs
Core Business: Services	New Actors: HighTech companies	Transitions: Differentiation
Customer Needs	New Actors: Importers	Transitions: Extended Products
Expansion Revenues	New Actors: Increasing	Transitions: Flexibilization Value Chain
Extended Products	New Actors: Insurance Companies	Transitions: Industry
Importance Services: Carsharing	New Actors: Mobility Providers	Transitions: Innovation
Importance Services: Connectivity	New Actors: OEM	Transitions: Market Flexibilization
Importance Services: Consultancy	New Actors: Platform Providers	Transitions: Markets
Importance Services: Customer Relation	New Actors: Public Transport Operators	Transitions: Mobility market
Importance Services: Differentiation	New Actors: Strategic Partners	Transitions: Mobility Provider
Importance Services: Ease of Use	New Actors: Telecom Companies	Transitions: New Services
Importance Services: EV	New Actors: Travel services/roadside assistance	Transitions: Offline/Online
Importance Services: Financial Services	New Customers	Transitions: Ownership-Usage
Importance Services: IT	New Services: Applications	Transitions: Responsibility
Importance Services: Leasing	New Services: Car Related	Transitions: Technological Developments
Importance Services: Mobility	New Services: Carsharing	Trends: Congestion
Importance Services: Quality	New Services: Consultancy	Trends: Customer Needs Mobility Integration
Importance Services: Value Creation	New Services: EV	Trends: Generation Y
Integration: Mobility	New Services: Increase	Trends: New Way of Working
Integration: Services	New Services: Mobility	Trends: Social Media
Market Demand	New Services: Mobility Integration	Trends: Sustainability
Market Expansion	New Services: Platform	Trends: Urbanization
Market Position	New Services: Ride Sharing	Value Network: Company Position
Markets: Asia	New Services: Telematics	Value Network: Competitive Advantage
Markets: Belgium	Reasons Carsharing: Costs	Value Network: Core Business
Markets: Company Position	Reasons Carsharing: Customer Needs	Value Network: Strategic Partners

Table 7: Code Families (12)

Code Family		Codes	Quotations
I	**Cooperation**	9	36
	[Cooperation: Customers] [Cooperation: Dealers] [Cooperation: increasing] [Cooperation: Insurance Companies] [Cooperation: Leasing Companies] [Cooperation: OEM] [Cooperation: Others] [Cooperation: Public Transport Operators] [Cooperation: Strategic Partners increasing]		
II	**Importance Services**	13	39
	[Importance Services: Car Sharing] [Importance Services: Connectivity] [Importance Services: Consultancy] [Importance Services: Customer Relation] [Importance Services: Differentiation] [Importance Services: Ease of Use] [Importance Services: EV] [Importance Services: Financial Services] [Importance Services: IT] [Importance Services: Leasing] [Importance Services: Mobility] [Importance Services: Quality] [Importance Services: Value Creation]		
III	**Integration**	2	29
	[Integration: Mobility] [Integration: Services]		
IV	**Markets**	17	56
	[Market Demand] [Markets: Asia] [Markets: Belgium] [Markets: Company Position] [Markets: Denmark] [Markets: France] [Markets: Germany] [Markets: Leasing Services high] [Markets: Maturity High] [Markets: Maturity Low] [Markets: Maturity Medium] [Markets: Mobility Services high] [Markets: Mobility Services low] [Markets: the Netherlands] [Markets: UK] [Markets: US] [Markets: Western Europe]		
V	**New Actors**	17	37
	[New Actors: Building Companies] [New Actors: Competitors] [New Actors: Consultancy Companies] [New Actors: Energy Companies] [New Actors: Financial Services] [New Actors: Fleet Managers] [New Actors: HighTech companies] [New Actors: Importers] [New Actors: Increasing] [New Actors: Insurance Companies] [New Actors: Mobility Providers] [New Actors: OEM] [New Actors: Platform Providers] [New Actors: Public Transport Operators] [New Actors: Strategic Partners] [New Actors: Telecom Companies] [New Actors: Travel services/roadside assistance]		
VI	**New Services**	11	53
	[New Services: Applications] [New Services: Car Related] [New Services: Car Sharing] [New Services: Consultancy] [New Services: EV] [New Services: Increase] [New Services: Mobility] [New Services: Mobility Integration] [New Services: Platform] [New Services: Ride Sharing] [New Services: Telematics]		
VII	**Reasons Car Sharing**	2	4
	[Reasons Car Sharing: Costs] [Reasons Car Sharing: Customer Needs]		
VIII	**Reasons Mobility Services**	3	12
	[Reasons Mobility Services: Costs] [Reasons Mobility Services: Customer Demand] [Reasons Mobility Services: Environmental]		
IX	**Services**	9	32
	[Services: Car Sharing] [Services: Commodity] [Services: Connectivity] [Services: Consultancy] [Services: Financial] [Services: Insurance] [Services: Leasing] [Services: Maintenance & Repair] [Services: Mobility]		
X	**Transitions**	22	122
	[Reasons Transition: Legislation] [Transitions: B2B/B2C] [Transitions: Collaborative Consumption] [Transitions: Connectivity] [Transitions: Core Business] [Transitions: Creating Awareness] [Transitions: Customer Needs] [Transitions: Differentiation] [Transitions: Extended Products] [Transitions: Flexibilization Value Chain] [Transitions: Industry] [Transitions: Innovation] [Transitions: Market Flexibilization] [Transitions: Markets] [Transitions: Mobility market] [Transitions: Mobility Provider] [Transitions: New Services] [Transitions: Offline/Online] [Transitions: Ownership-Usage] [Transitions: Responsibility] [Transitions: Technological Developments] [Value Network: Core Business]		
XI	**Trends**	7	29
	[Trends: Congestion] [Trends: Customer Needs Mobility Integration] [Trends: Generation Y] [Trends: New Way of Working] [Trends: Social Media] [Trends: Sustainability] [Trends: urbanisation]		
XII	**Value Network**	3	30
	[Value Network: Company Position] [Value Network: Competitive Advantage] [Value Network: Strategic Partners]		

3.4 Case study protocol

As stated before, the case study research design is generally criticized for lacking formal approaches. Case studies tend to be relatively ill-structured and highly dependent on the capabilities and competences of the researcher. Therefore a case study protocol was developed as an essential guide for the multiple-case study conducted in this research project. It is a standardized data collection instrument for the researcher, based on the steps suggested by Yin (Yin, 2009). It contains the instrument, the procedures and general rules to be followed. It gathers the conceptual and practical matters of collecting the data and is meant to structure the inquiry (Yin, 2009). This increased the reliability of the case study. In step 1 an overview of the case study project is provided and the case study selection is discussed, followed by the methods of data collection in step 2. The case study questions, describing what information is collected and what sources are used in step 3. The final step provides a case study guide and the interview protocol.

Case study overview

The research goal of this project is to identify the transition to services in the automotive mobility industry by defining the changes in value creation. Two case studies are used to gain in-depth knowledge of the value system. The case studies provide insights from companies active in downstream activities of the automotive industry on their value creation structure and the transition to services.

Case Study data collection plan

During the course of this research project several conferences were attended by the researcher to establish contacts for the interviews and to get insights in the most recent developments in automotive services. The following conferences were visited: Smart Mobility Form, Brussels (May 30), IBM Solutions Connect, Utrecht (June 4), Energy Forum, Rotterdam (June 21) and BMW *i*3 College in Leiden (September 2). The aim of attending these events was to get into contact with business people for interviews, business cards were exchanged with multiple potential interviewees. In this way access was gained to key organizations. Evidence was based on future outlooks, perceptions of interviewees and analysis of the current situation. Prior to the interview meeting the company website and blogs were analyzed by the researcher to gain insights in the current service offerings and new projects. This provided a clear vision of the company's position in the automotive industry. Furthermore the interview questions were adapted to the knowledge of the interviewee of the company, the interviewee was selected on its position in the company and its relation to the topic investigated. In order to be sure to have sufficient resources, the researcher carried his laptop, pen and paper and used a recorder, if agreed upon with the interviewee. The data collection activities were scheduled via Email with the handpicked company contacts. Before the interview took place a topic list was send to the interviewee including a one pager about the research project and a preliminary version of the Value Network of services of the focal company. Since part of the case study questions is the development of the Value Network of services. The Value Network map was send prior to the interview in order for the interviewees to comment on during the interview. The Value Network was updated after each interview, checked and further defined in the following interview. Afterwards the interviewees received a transcription of the interview and were asked to provide comments on the transcription. The first half of the interviewees was requested to share contact details of colleagues within the company to increase the validity of the research. Duration of data collection was found to be depended on the availability of the interviewees and therefore took 2,5 months, in total 12 interviews were held with industry experts at four companies, see Appendix F.

Case study questions

This is the central part of the case study protocol. The case study questions are reminders for the researcher regarding the information that needs to be collected and why in order to keep the researcher on track as data collection proceeds. Each question is accompanied by a list of likely sources of evidence. These questions provided guidance by forming the structure of the inquiry. The focus of the questions asked lies on the individual case. Four types of case study questions were posed, related to the context, services, value creation and industry structure. The case study questions identified what data needed to be collected (Yin, 2009). A division was made between the source of evidence namely documents (D) or Interviewee (I) or both.

Case study questions related to the context

- Collect data about the business model of the company, identify its tasks and core business (D+I)
- Collect data about size and international orientation (D+I)
- Define comparable competitors, and potential competitors (D+I)
- Define the position of the interviewee within the company and his/her tasks and responsibilities (I)
- Define how the company is positioned within the industry, what are key tasks and core businesses (D+I)

Case study questions related to services

- Confirm what services the company is currently offering (D+I)
- Collect more information on why these services are offered (I)
- Identify the offerings with the services matrix (D+I)
- Describe the future services of the company (D+I)
- Collect data about why the company is evolving into these new services (I)
- Define the business model of the new service projects (I)
- Identify collaboration partners of the company, now and in the near future (D+I)
- Define on what grounds the company is collaborating and will do in the future (D+I)

Case study questions related to value creation

- Define the relationships and the value perceived by the actors in the network (D+I)
- Describe how value is created within the value network of the focal company, now and in the future (I)
- Identify what value is exchanged in the value network, and how this will change (I)

Case study questions related to industry organization

- Define the influences of each value network actor and how this will change (I)
- Map the Value Network in the current situation with central the focal company (D+I)
- Map for the focal company the Value Network of the future (I)

Case study guide

Based on the case study questions, an interview protocol was developed to guide the researcher when conducting the interviews, see Appendix E and F. The NVA and hypotheses were used as guidance for the questions. Questions were posed about both the current value network and the expected future. The interviewees were expected to not remember exactly the date of introduction of new services. Therefore documents and archival records were used to complement the findings and construct the timing of introduction of the services exactly, based

on release databases. During the interviews follow-up questions were posed to clarify earlier responses. To ensure that the interviewees felt free to describe their own experiences and opinions the researcher allowed sidesteps and supported elaborations during the interview. Remarkable findings from previous interviews were clarified and tested in subsequent interviews. For each case a database was assembled including documents, interviews, intermediate reports and archival records. After the interviews the processing started. The recordings were transcribed and the transcriptions were verified. A letter of thanks was send to the interviewee and the transcriptions were analyzed, see paragraph 3.3.

The cases were selected following on a quasi-natural experiment. Companies were selected that had proven to be innovative and receptive to changing conditions. Furthermore, the cases were chosen to differ in position in the automotive value system (OEM and fleet management companies). The interviewee selection was semi random since the contacts with industry experts for the case studies were established during several events related to topic.

The outline of the case study report is divided into two chapters. Chapter 5 serves as an introduction of the focal companies (case OEM: BMW and Case FMC: the fleet management companies Alphabet, Athlon Car Lease and LeasePlan). This chapter provides a description of the current situation of the focal companies, based on desk research and the expert interviews. By mapping the value network of downstream activities in the automotive industry, an overview of the industry structure is provided per company investigated. Chapter 6 discusses the four hypothesis posed in chapter 2 and aims to answer these based on the data analysis in Atlas TI. Here the transition to services is analyzed per case, a description of the future vision of the focal companies is posed and market changes are discussed.

3.5 Quality criteria

Following on the research design, data collection, data analysis and case study protocol it is relevant to discuss the quality considerations concerning the methodology. The qualitative nature of the research gives rice to replication issues and researcher bias. The criteria for the evaluation of this research project are the traditional four design tests of reliability and construct validity, internal validity and external validity, see Table 8 (Bryman, 2012) (Yin, 2009).

The reliability of a research project is defined by the degree of replication. Three important factors are stability, internal reliability and inter-observer consistency (Bryman, 2012). The design test of construct validity identifies whether the theoretical concepts are correctly operationalized (Yin, 2009). Construct validity and reliability of the case study evidence were assured by following the three principles of data collection of Yin, by using multiple sources of evidence to develop converging lines of inquiry, creating a case study database and maintaining a chain of evidence (Yin, 2009). Important to notice here is that only a small period of the automotive industry was analyzed using both methods of documents and interviews at the same time, see Figure 11. The internal validity design test identifies whether all relationships found in the research are explainable and form a causal chain of evidence. Due to the exploratory nature of the research it was found impossible to implement the technique of pattern matching to increase internal validity. The fourth design test is concerned about generalizability (external validity). Often there is a tradeoff between external and internal validity. External validity identifies to which degree the findings of the research project can be used in another setting than researched using analytical generalization (Strauss & Corbin, 1998). Because the case study research was based on a small number of cases, generalizability to other cases was found difficult to accomplish. But enhanced by the spread of data, high rank of interviewees (especially for the BMW case) and the representative market sample for the FMC case. The quality of the theoretical inferences that were made based on the data was crucial to the assessment of analytic generalization (Bryman, 2012) (Yin, 2009).

Table 8: Overview quality criteria and measures taken

Test	Measures taken	Paragraph
Reliability & Construct validity	Data triangulation ensuring multiple sources of evidence: interviews and documents	3.1
	All interviews are recorded and transcribed to minimize errors in processing the information of the interviewees	3.3
	Transcriptions are coded twice by the researcher to improve coding	3.3
	Case study database is developed	3.4
	Chain of evidence is maintained, facilitated by the usage of ATLAS TI	Chapter 6
	Inclusion of a second coder to determine the inter-coder reliability	Appendix H
Internal validity	Multiple interviewees per company and ample time allowed to contact the right interviewees	3.4
	An extensive system of analysis is used in the case study protocol to describe the decisions taken, guiding the analysis	3.4
	Cross case analysis is done showing case similarities and differences	6.5
	An interview protocol is used providing the same initial set of questions for each interview	Appendix E
External validity	Generalizability of the FMC case due to spread of data, consistency in the data and a representative market sample.	Chapter 5 Appendix F
	Generalizability of the OEM case due to the high rank of the interviewees within the company, indicating a strong strategic focus	Chapter 5 Appendix F
	(semi) Random selection of interviewees in Western Europe (BE, DE, NL)	Appendix F

4 Industry History

This chapter provides a brief description of the major transitions of the 20th century in the automotive industry, and thereby answering the third research question.

RQ 3. *What trends can be identified in the automotive industry in the past century, and what caused the structural changes?*

The industry is said to be in a constant state of flux due to the influences of a changing environment. This is due to the fact that a car is not just a physical product of technology, history shows it also has social, cultural, environmental, economic and political dimensions (Orsato & Wells, 2007). The global automotive industry has developed over a period of more than a century and has become a vast entity of many inter-connected parts increasingly focusing of services. Yet, paradoxically, the automotive industry retains characteristics from the earliest years of its existence. The automotive industry has gone through several fundamental transformations (Altshuler, Anderson, Jones, Roos, & Womack, 1984) (Maxton & Wormald, 2004) (Nieuwenhuis & Wells, 2004) (Becker, 2006). Meanwhile, by contrast, the basic concept of the car has hardly changed in the last century. An analysis of the transformations in the automotive business history is important to understand its long term competitive balance. The industry has changed its way of doing business several times in order to cope with the changes in the environment. Each transition involved a major discontinuity in the organization of the industry and enabled a leap forward in productivity and cost. The transformations changed the rules of the game and every time the initiator benefited from the change disproportionately (Maxton & Wormald, 2004). The first car was based on a wooden carriage or stage coach, the so called horseless carriage in the veteran era (1888-1905). A standardized layout for cars came with Panhard et Levassor's Système Panhard in 1895 with a front-engine, rear-wheel drive, an internal combustion engine (ICE) and a sliding gear transmission. After the invention of the car at the end of the 19th century four general periods of transition are identified: 1900-1930, 1930-1960, 1960-1990 and 1990-2007.

4.1 1900-1930

This period is highlighted by innovations that still form the basis for the automotive industry today. The period can be divided in the era of product development from 1900 to 1908: the era of rapid expansion from 1908 to 1918: and the era of replacement demand from 1918-1929 (Thomas, 1977). In the first era, Ford introduced mass production manufacturing with the introduction of innovative shop floor techniques. The production process of the Ford Model T in 1909 was the first transformation of the automotive industry. Mass production marked the era of rapid expansion and completely changed the automotive business. Two elements were important, the most crucial element was the use of interchangeable standard parts, second the use of a continuously moving assembly line (using conveyor systems) (Maxton & Wormald, 2004) (Nieuwenhuis & Wells, 2004). The combination of these two elements made the mass production of highly complex multi-functional products economical viable, and caused the rise of so called Fordism. Furthermore Ford achieved high levels of vertical integration, unknown for car manufacturing today, owning mines, smelters, forests and shipping companies, see box 1 (Nieuwenhuis & Wells, 2004) (Langlois & Robertson, 1989) (Kothandaraman & Wilson, 2001). This was done in order to protect their sources of supply and distribution networks, achieving economies of throughput and amortize their fixed investments (Langlois & Robertson, 1989). As a result the Ford Motor Company was one of the most integrative operations in the world (Kothandaraman & Wilson, 2001). Another important invention of this period was the body-chassis technology introduced by E. Budd in 1914. The all-steel welded body and the press and jig technology called Buddism caused a technological overhaul (Nieuwenhuis & Wells, 2004). It substituted the traditional labor intensive wooden frame for steel in order to integrate the chassis and the car body in one piece (Orsato & Wells, 2007). This defined the technological paradigm currently still embedded in the modern automotive industry. The scale and pace of contemporary manufacturing are determined by the high level of initial investment costs in manufacturing all steel bodies (Nieuwenhuis & Wells, 2004) (Orsato & Wells, 2007). As a result of the rapid expansion, by 192O the car market had changed radically. Cost relationships between OEMs and suppliers became increasingly important. By the end of the 1920s, a modest reduction in the degree of vertical integration had begun, based on a new appreciation of the flexibility that could be derived from outside suppliers (Langlois & Robertson, 1989).

Box 1: Extreme Vertical Integration at Ford in 1910

"Ford's desire for control went beyond material and components. To transport materials to River Rouge and finished products to dealers he invested in railroads, trucks, and both Great Lakes and ocean vessels. The idea was to control all aspect of inventory moving from a network of over forty manufacturing, service, and assembly plants throughout the United States, Canada, Australia, New Zealand, and United Kingdom, and South Africa to dealers throughout the globe.
This was clearly one of the most ambitious vertical integration schemes, and Ford found he needed help. At the peak of Ford's vertical extension the firm faced economic, regulatory, and labor union barriers that eventually required products and services to be provided by a network of independent suppliers. The key to effective marketing was finally found by developing a strong network of independent dealers. As time passed, Ford discovered that specialized firms could perform most essential work as well as or better than his own bureaucracy. In fact, these specialists often outperformed Ford's own units with respect to quality and cost. Entrepreneurial firms soon became contributors to Ford's network. Over time, the Ford strategy shifted from ownership-based control to one of orchestrating channel relationships. The financial resources at Ford were shifted to developing and maintaining core manufacturing competencies. Ford found out that in the final analysis, no firm can be self-sufficient." (Bowersox & Closs, 1996)

The first sign of services becoming part of the automotive industry was with the introduction of car rental service companies in the US in 1916 and 1918. These companies rented several of the popular Ford Model T's and were the first sign of services in the automotive industry. By acquiring one of these car rental companies John D. Hertz created in 1923 the Hertz-Drive-Ur-Self System,

which developed into a large scale car rental company. In 1919, GM was the first OEM to establish a non-bank financing source for automobile loans to support their car sales. Since then the downstream services of both financing and leasing business have been a part of the automotive industry (KPMG, 2012). Another important innovation was the highly successful Sloanism product strategy of GM CEO A. Sloan "a car for every purse and purpose" introduced in 1924 (Sloan, 1964). GM focused more on the mature markets by introducing several car brands, from volume to high-end luxury cars, this strategy is still used in the modern automotive industry today. Although the concept of common platform merely got attention in the late 20th century onwards, platform consolidation was actually already introduced in the 1920's to grasp economies of scale. By 1927 replacement demand for new cars was exceeding demand from first-time owners and multiple-car purchasers combined and the used-car market caused a new source of competition for OEMs. In response OEMs improved their new cars continuously in order to provide a competitive advantage over older models. The annual model modification and product innovation changed the pattern of vertical integration (Langlois & Robertson, 1989). As a result, the percentage of components attained from suppliers declined from 55 percent (1922) to 26 percent (1926) of the wholesale value of cars in the US (Langlois & Robertson, 1989). Instead of an evolutionary approach in the traditional car production cycle, radical new innovations became increasingly important. This caused an era of replacement of demand. In these years, the use of credit purchases for expensive consumer goods (like cars) was becoming increasingly popular in the US. Meanwhile the market for spare parts was growing, due to the aging national fleet, generating a new steady source of services related revenues for OEMs.

4.2 1930-1960

This period is highlighted by the revision of the ideas of mass production and new ideas of approaching the market. An organizational innovation was introduced by A. Sloan at GM with the application of the divisional company structure (the M-form) (Langlois & Robertson, 1989) (Maxton & Wormald, 2004). The organizational structure caused a rational distribution of roles between specialized entities by decentralizing the day-to-day decision making but retaining a centralized strategic and coordination ability. GM also initiated a new way of advertising, by positioning cars as emotional objects, this created the brand-driven industry with a focus on customization. GMs innovations in marketing and organization allowed each major operating division to serve a distinct product market, combining differentiation with mass production (Maxton & Wormald, 2004). A distinctive feature of this early stage of differentiation was the low amount of generic parts and subsystems that could be used in a wide variety of end products. Parts and sub-systems tended to be specific to particular car models. This undermined modularity in the value chain and tied suppliers to specific OEMs. As a result 90% of the cars were produced by the Big three (GM, Ford and Chrysler) at the end of the 1930s in the US. In these years differences between the US and European car market started to come apparent. The US market demanded luxurious, large and powerful cars, European customers on the other hand merely preferred smaller and low-priced cars. In Europe there was also a flourishing market for sophisticated high performance cars, the so called high-end specialists. The high-end tradition involved cars from Bugatti and Delage in France, Hispano-Suiza in Spain, Isotta-Fraschini and Alfa Romeo in Italy, Daimler-Benz, Horch, Maybach in Germany and Rolls-Royce and Bentley in Great Britain. Several specialists, like Mercedes, Bugatti, Bentley and Alfa Romeo, were legendary in racing and sporting activities during the prewar era (Clark & Fujimoto, 1991). But transition to mass produced cars with

pressed steel bodies (Buddism) caused the demise of most of these small independent car manufacturers and coachbuilders in the 1930s. Also the great depression of the 1930s and the Second World War had a severe effect on the automotive industry. It caused the bankruptcy of numerous small luxury car companies, their parts suppliers and the custom-body companies (Badger, 1989).

In the first years after World War II, the automotive industry suffered from a shortage of sheet steel and tires, but at the end of the 1940s worldwide car production was flourishing. OEMs in Europe started to combine mass production with an emphasis on product differentiation to challenge the US based production in the 1950s (Altshuler, Anderson, Jones, Roos, & Womack, 1984). Car sales increased due to government regulations, increased wages and due to larger suburbs cars became increasingly a necessity, especially in the US. In that same period the car rental industry grew rapidly due to the growing air travel market, fly-drive services became increasingly popular. Production of cars in Western Europe rose from 1.6 million in 1950 to 6.1 million in 1960. European volume producers emerged with so called people's cars providing basic transportation at a low price like the VW Beetle (over 20 million units were sold), Citroen 2CV (5 million units), Fiat 500 (3,9 million units) Morris Minor (1,3 million units) and Renault 4CV (1 million units) (Clark & Fujimoto, 1991)(Volpato, Camuffo, & Comacchio, 1999). A key aspect of the post war economy was that a slight growth of car demand could bring heavy trade imbalances for non-manufacturing countries from the second half of the 1950s on. Therefore several governments opted for the introduction of import tariffs to reduce the import, this partly caused the upcoming globalization trend (Volpato, Camuffo, & Comacchio, 1999) (Humphrey & Memedovic, 2003). The increasing complexity of the technologies necessary to build a car forced OEMs to disintegrate their operations, opposite to Ford's vertical integration in 1910 (Kothandaraman & Wilson, 2001).

4.3 1960-1990

In the 1960s the production system of regional integration started to take off in North America with the free import and export between the US and Canada cars and components were designed and produced for the region as a whole (Humphrey & Memedovic, 2003). When the production system became increasingly integrated and organized on a regional level, cars and components were produced for the region as a whole. The minimum efficient scale of a car assembly plant more than tripled between 1960 and 1975 and the pace of technological change increased (Porter, 1986). The Japanese OEM Toyota made extensive breakthroughs in production organization and automation. Their introduction of lean production caused the so called third transformation of the automotive industry (Dannenberg & Kleinhans, 2007). This Toyota Production System (TPS, or Toyotism) was strongly related to the principles of Kaizen, Just-in-time and lean production. Although it was not invented by the automotive industry, but by IBM, it was perfected by the Japanese manufacturer. The key aspect of this production system is that each stage of the manufacturing and assembly process pulls intermediate products from the previous stage (Maxton & Wormald, 2004). The introduction of lean production resulted in a decrease in the number of direct suppliers by a factor of ten while a degree of control in product development was passed to the leading suppliers (Wells, 2010). This provided the Japanese OEM Toyota a key advantage over the traditional production systems in Europe and the US. The quality of relationships became highly important because a great deal of trust was incorporated in the system enabling just-in-time manufacturing.

New services came into play when leasing companies became part of the automotive industry offering fleet management, leasing and fleet services, bringing a new way of revenues to the industry. This changed the ownership structure, since the fundamental characteristic of a lease is that ownership never passes to the business customer. Another major step in service business was the increasing attention for new business units within OEMs focused on finance in the 1970s. The business expanded to insurance in the 1980s and traditional banking series in the 1990s, see box 2 (Kessler & Stephan, 2013). OEMs like Chrysler and Ford started to show interest in the car rental service industry in the 1980s. The fuel crisis and recession in 1973-1979 had its impact on the automotive industry, with an even stronger emphasis on cost reduction in car manufacturing. Since the 1970s, market demands for differentiation have increased, OEMs focused on the proliferation of platform strategies to reduce costs (Nieuwenhuis & Wells, 2004). The relationships between OEMs and suppliers changed considerably as the western companies struggled to match the competitiveness of Japanese OEMs. The challenge faced by the European OEMs in the 1980s was how to change their industrial model (Freyssenet & Lung, 1999). The intensification of competitiveness among OEMs had led to structural changes in the automotive industry in the years to follow. Resulting in a transition from vertical integration to outsourcing, a structure where production of car parts was increasingly delegated to suppliers (Volpato, Camuffo, & Comacchio, 1999). OEMs further reduced their in-house production levels and began to transfer design functions to their leading suppliers (Humphrey & Memedovic, 2003). Innovative components became important and therefore a co-design relationship between the OEM and the supplier's network started to take off. This influenced the supply chain, making it more structured by a reduction of the number of suppliers and increased outsourcing to suppliers by OEMs. Smaller suppliers became TIER-2 and TIER-3 suppliers carrying out technological specialized activities for TIER-1 suppliers (Haag & Vroom, 1996). Furthermore the regionally oriented competition between OEMs started to evolve to global competition (Haag & Vroom, 1996). At the end of the 1980s, OEMs posed that they were beginning to think of their business as that of 'mobility provider' rather than a car manufacturer (Nieuwenhuis & Wells, 2004). The sellers' market had lasted for many decades but it ended at the end of the 1980's due to overcapacity, wider choice, dealer freedom and better quality products (Ludvigsen, 1996). As the market shifted from producer controlled to customer driven, the importance of customization increased due to sophisticated consumer demand (Haag & Vroom, 1996).

BOX 2: Service transitions at BMW 1970-1990

"The strategy vision of the company is to diversify into the service business and to evolve to the leading provider of premium products and premium services for individual mobility" (BMW, 2012)

"The first major step into the service business was made in 1971, when BMW created BMW Kredit GmbH. Intended to finance the parent company's own businesses and car dealers especially, today BMW Financial Services form the base for its finance and leasing business. The financial services segment offers lease and credit financing of BMW group vehicles both for retail customers and fleet customers: financing is also offered to BMW dealers – BMW Financial Services serves as a partner to the sales organization in more than 50 countries. Based on the resources and competencies accumulated in financing and leasing, the business expanded into insurance in the 1980's and into traditional banking series in 1990.

Since the 1970s the company also diversified into other car-related services besides financing. Triggered by the wish to get a closer contact with customers and to increase their emotional attachment to the brand, BMW group was one of the first OEMs to initiate a driver training program with BMW Driver training in 1977. BMW introduced the BMW Service Card which offered BMW customers in Europe free cross-border services, including break-down assistance, towing services, hotels, taxi-travel and rental car offerings in 1990." (Kessler & Stephan, 2013)

4.4 1990-2007

This period is highlighted by an increased complexity due to a vast number of substantial changes and raised attention for services in the automotive industry. The West-European markets became saturated with annual sales of about 12 million cars and cost reduction became a more important differentiator than ever before in the highly competitive market. At the same time the market became increasingly fragmented due to the rapid increase in number of variants on offer (Orsato & Wells, 2007). The challenge for the automotive industry was how to reorganize internationally and therefore is seen as a new phase of transition after the crisis in the 1970s (Freyssenet & Lung, 1999). The manufacturing system based on economies of scale came under pressure in the 1990s due to the increasing market fragmentation and the ever shortening of car life-cycles.

Cost reduction in this period is characterized by raised platform consolidation and modularization strategies. Platforms generally included rolling chassis, which expanded to components as suspension parts, engines and transmissions (Sturgeon, Memedovic, Van Biesebroeck, & Gereffi, 2009). The modularization strategy, involved interchangeability between modules and heavy outsourcing to reduce production costs. This required a shift in both organizational and social relationships between companies, see box 3. As a result suppliers increasingly provided a full service to assemblers by supplying sub-assemblies in large volumes. This also allowed suppliers to reduce cost by developing similar products for different brands (Morris, Donnelly, & Donnelly, 2004). Causing several former in-house component activities to become independent suppliers to encourage cooperation with other OEMs, such as Delphi (former GM), Visteon (formerly part of Ford) and Magneti Marelli (Fiat) (Humphrey & Memedovic, 2003). These signs of rearranging the activities in the value chain were a first step in the upstream value chain innovation process (Beelaerts van Blokland, Fiksinski, Amoa, & Santema, 2007). As a result the real net output ratio of OEMs constantly dropped, from 60% in 1990 to a mere 30% in 2000 of the value created (Eklund, Askerdal, Granholm, Alminger, & Axelsson, 2005).

Box 3: The Smart Car

The first implementation of a complete modular approach, consisting of product architecture, modular production and inter-firm systems was established by the collaboration of watchmaker Swatch and Daimler in developing and producing the Smart car (Morris, Donnelly, & Donnelly, 2004). Where a typical car today is likely to necessitate the coordination of around 100 suppliers, the Smart car collaboration had been engineered and designed using 25 module suppliers. The benefits of this approach are clear: less direct suppliers to deal with, lower costs to the OEM and less risk and less investment in capital assets. The module supplier benefits in terms of increased responsibility, and more involvement in the development and design processes and the possibility of higher proportion of value creation activity (Doran, 2004).

Globalization, which started around 1985 had become a core strategy for the automotive industry to capture the economies of scale (Nieuwenhuis & Wells, 1997) (Lung, 2004). The global sourcing system is seen as the last part of the components supply system reorganization (Volpato, Camuffo, & Comacchio, 1999) (Freyssenet & Lung, 1999). This globalization period is identified by Mergers & Acquisitions of OEMs and equity based alliances influencing corporate strategy, economic geography, industry structure and jobs (Sturgeon & Florida,

BOX 4: New Services at GM

The move to services and reorientation of the OEM became also visible when GM introduced the GM card in 1992, a GM branded credit card (Ludvigsen, 1996). This is form of aftersales service is part of the financial services division of the OEM, which had proven to be by the far the richest potential area for the improvement of customer relations and the development of customer-friendly relations on the part of OEMs and dealers. With more than 10 million card users in 1994 it was a huge success. The data gathered was used to offer marketing programs with appropriate offerings of warranty coverage and service provision increasing customer loyalty (Ludvigsen, 1996).

2000) (Lung, 2004). The decomposition was impacted by several factors: financial globalization, liberalization of world trade and deregulation, the constitution of regional entities and finally the emerging markets (particularly Asia) (Freyssenet & Lung, 1999) (Humphrey & Memedovic, 2003). This changed the industry again significantly due to concentration of production to low cost locations and increased coopetition among OEMs. Also the downstream service companies showed an increasing number of mergers in this period, resulting in large multinational leasing and rental companies, most became acquired by large commercial banks. The automotive industry had shifted from a series of discrete national industries to an integrated global industry (Sturgeon, Memedovic, Van Biesebroeck, & Gereffi, 2009). Dominant OEMs extended their portfolio by M&A of several smaller car manufacturers and evolved in large multi-brand groups. Foreign direct investment (FDI), global production and cross-border trade increased tremendously in this period. Furthermore outsourcing was employed on a far larger scale as was the bundling of value chain activities in suppliers. This resulted in extremely concentrated company structures in the automotive industry were cooperation and co-design gained significance (Sturgeon, Memedovic, Van Biesebroeck, & Gereffi, 2009). A strong regional structure is visible within the globalization which intensified since the mid-1980s. This regional-scale integration of production of integration is merely visible in the supplier industry (Sturgeon, Memedovic, Van Biesebroeck, & Gereffi, 2009). OEMs became more involved in the specification of the production and quality systems of their suppliers, causing stronger and tighter relationships with fewer suppliers. This resulted in so called 'follow sourcing': suppliers followed the OEM to the new locations. Several other factors influence this regional production of 'build were we sell': e.g. transport costs, influence of lean production and high rates of unionization and import tariffs (Sturgeon & Florida, 2000). As a result, the OEMs increasingly outsourced former traditional primary activities to the supplier value chain since those activities were no longer key value generators (Beelaerts van Blokland, Fiksinski, Amoa, & Santema, 2007) (Kothandaraman & Wilson, 2001). Meanwhile OEMs increasingly differentiated into banking via their financial services divisions as an answer to the limited growth potentials in the traditional markets since 2000 (Huber & Bauer, 2009). With the diversification into services OEMs were able to retain new sources of revenues, see box 4. The Financial services divisions started to explore new segments in their traditional value chain based on established automotive business concepts (Kessler & Stephan, 2013). Next to FMCs, OEMs started to offer all-in leasing contracts through their own financial services departments, where monthly payments cover the leasing rate for the car but also include insurance, taxes and all maintenance costs. Leasing had become increasingly popular as a means of having access to capital goods, this was essential for the future of the industry. Making total mobility available was becoming the key characteristic for differentiation: this includes the transfer of use of the car and their service integration into a total mobility concept (Seidel & Richter, 1998). It is a responds to perceived customer needs and social pressures on the automotive industry, see box 5.

BOX 5: Service transitions at BMW 1997-2007

"In 1997, BMW established Alphabet in the UK as the fleet management subsidiary of the BMW group. Over the subsequent years, BMW expanded its Alphabet fleet management services across Europe. The expansion of the fleet management business was driven by both, Greenfield investments and major M&A of competitors, e.g. DSL Fleet services (2006) and ING Car lease (2011). Over the years, the fleet management business has also been linked and integrated with the fleet customers business of BMW Financial Services. Today Alphabet is a top 5 fleet service provider in Europe.

In 2005 BMW initiated its ConnectedDrive label for an IT based car design concept that integrated a bundle of IT-based mobility services into BMWs by networking individual vehicle functions and linking the car to internet based service offerings like Google search, e-mail or hotel booking. It entails three functional areas: 'convenience' includes vehicle management for better car handling, navigation and travel services, 'infotainment' provides unlimited internet access, news services, and mobile office and telephone services. Finally, 'safety' provides a variety of drive assistance and emergency functions. BMW considers 'ConnectedDrive' to be a business model approach to evolve into a service-focused OEM." (Kessler & Stephan, 2013)

5 Case Studies

In many respects the automotive industry is standing on the threshold of another structural transition in Western Europe. Due to the changes in the automotive industry towards E-mobility, coupled with an increasing demand for mobility services such as carsharing, and the saturation of markets, new service business models are implemented (KPMG, 2012). As proposed in chapter 3, this chapter starts with a description of the current situation in the automotive industry according to two cases. The companies analyzed in the cases are selected following the quasi-natural experiment. The first study describes the situation of downstream activities at OEM BMW, see paragraph 5.1. The study is introduced and describes the current value network of services at BMW. OEMs are found to play a key role in the automotive industry. Due to their extensive control over the value system and core business in products, the transition to services in highly relevant to investigate. BMW is selected since it is found to be a frontrunner in services related to (E-)mobility and connectivity. Since services are the central topic for this research, therefore the second case analyzes fleet management companies (FMCs) with their core business in leasing services. This case provides another interesting context for the transition to services. Three major fleet management companies active in the fleet management business in Western Europe are analyzed: Alphabet, Athlon Car Lease and LeasePlan. Combined these three companies manage a fleet of over 2 million cars, see paragraph 5.2. For each of these companies a value network of services is mapped, showing the services and their strategic partners, see Figure 9. The value networks are based on data retrieved via interviews and desk research. For each interview the Value Network of the focal company was updated according to the insights gained at the previous interview resulting in a fully verified value network of services, see paragraph 3.2. The value networks are a graphical representation of the services at the focal companies, based on the quality criteria stated in paragraph 3.5.

5.1 Case Study: OEM

Nowadays OEMs combine their core capabilities of design, assembly and their ability to cooperate with suppliers in a car manufacturing value chain with a growing division in financial services (FS), see Figure 1. Due to the declining profitability of manufacturing, OEMs are forced to concentrate their value adding activities on branding and customer management and incorporate downstream service activities (Bharadway & Ter Hofstede, 2006) (Nieuwenhuis & Wells, 2004). As a result, OEMs started to focus on services with the introduction of financial services divisions in the 1970s, forming an important source of value creation. OEMs established new value creating activities through service packages: integrating finance and insurance services into traditional (after) sales, maintenance and repair services. Today the FS divisions generate about 20% of the total revenues and are key in the OEM business model (Maxton & Wormald, 2004) (Wells, 2010) (BMW, 2013). Furthermore the OEM banking divisions have taken over the tasks of the commercial banking sector by financing 25% to 40% of new car sales (KPMG, 2012). Thus, OEMs have numerous downstream service activities to complement their product offerings. In line with this increasing attention to services OEMs have developed visions to evolve towards a provider of integrated and individual mobility (Kessler & Stephan, 2013).

In this research the OEM BMW is analyzed to identify the transition to services. The BMW group manufactures cars under the BMW, Mini and Rolls Royce brand and is based in Munich, Germany. It is one of the most successful premium manufacturers in the world, selling 1.67 million cars in 2013 (BMW, 2013). The OEM is changing its position in the automotive value system, from manufacturer of premium cars to premium provider of individual mobility, with its Strategy number ONE mission statement of 2007 (BMW, 2013):

> "In 2020 the BMW Group is the world's leading provider of premium products and premium services for individual mobility."

At present the OEM is highly investing in new services and products, has a clear history in services and a distinctive future vision on mobility services with BMW *i*, see box 6. For a complete overview of services at BMW see also Box 2 and 5 in chapter 4. The company offers a comprehensive range of services for retail and corporate customers with its Financial Services division: BMW lease and credit financing, multi-brand financing, dealer financing, insurance, fleet management and banking and mobility services.

Box 6: The next service transition, BMW *i*

"In 2011 the BMW Groups launched BMW i, with BMW i the company is planning to adopt an all-embracing approach of personal mobility services with purpose-built vehicle concepts, a focus on sustainability throughout the value chain, and a range of complementary mobility services. The mobility services are an integral part of BMW i. the offering of custom-designed mobility services can be used independently of the vehicle itself. Beyond vehicle-bound services like intelligent navigation systems, LBS and efficient use of existing parking space, BMW i mobility services focus on intermodal route planning and multimodal offerings, including carsharing, long-distance train and local public transport services. In addition to developing and offering its own services, BMW i provides multimodal mobility services in partnership with other companies. BMW has initiated cooperation projects together with other mobility service providers, including the carsharing joint-venture DriveNow that was established together with the rental car firm Sixt, and the strategic alliance with long distance railway service providers and local public transport firms. Besides creating partnerships, BMW i Ventures makes strategic investments in start-up mobility service providers." (Kessler & Stephan, 2013)

5.1.1 Value Network of Services at BMW

As described in chapter 3, based on the desk research and the interview data the value network of services at BMW is developed as shown in Figure 14. The network is based on the value network of Peppard and Rylander (2006). OEMs have expanded to fleet management services with the introduction of captives in the financial services divisions, which gradually expanded into a full bank. In 1997 BMW established a multiband independent fleet management service company (Alphabet) next to the leasing services of their captive. Most services are introduced in recent years, e.g. connectivity services (the BMW ConnectedDrive service started in 2005), mobility services (DriveNow was introduced 2011) and E-mobility services with the introduction of BMW *i* in 2013. BMW i Ventures screens multiple new start-up investment opportunities to provide a combination of car related mobility servicers (SMM, 2013). This is all in line with the goal of becoming the world's leading premium mobility services provider. Therefore, the number of service related strategic partners has expanded: for example BMW has a partnership with Apple in the area of IVI with iOS in the Car. The OEM is accustomed to cooperation with a large array of strategic partners for multiple decades. This is mainly due to the intensive cooperation in the manufacturing process with TIER suppliers, see Appendix A.

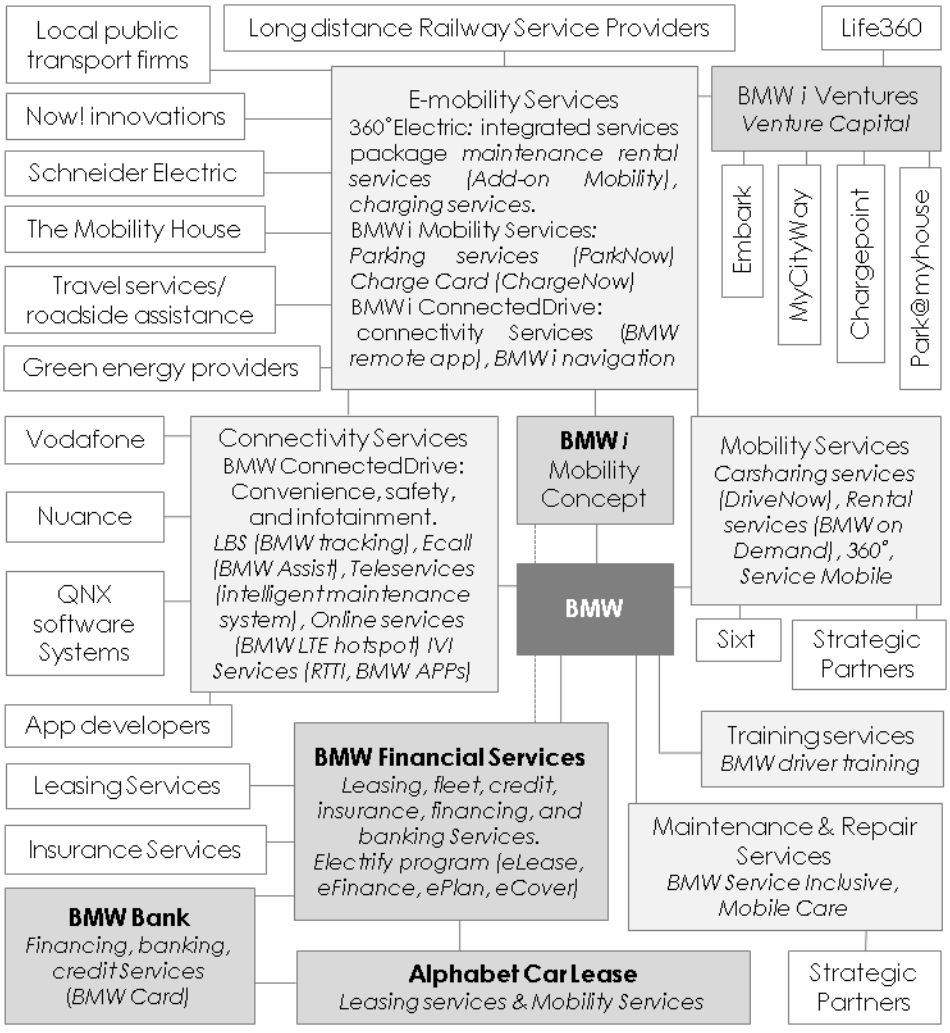


Figure 14: Value Network of Services at BMW

5.2 Case Study: Fleet Management Companies

The finance and leasing business is a particularly important part of the downstream activities in the automotive industry. Especially for the highly competitive West-European market where on average 50% of the company cars are leased (KPMG, 2012). The UK and the Netherlands are the most developed countries in the area of leasing services followed by Germany, Belgium, France and Denmark. Fleet management companies (FMC) can offer all services related to car usage to their corporate customers: financing, leasing, insurance and fleet management services (maintenance and repair, roadside assistance, rental services and accident, fine, tax, tire and fuel management services) and well as used car services. In the case of full operational lease a complete service package is incorporated, to cover a risk free usage of the car fleet for the duration of on average 47 months.

> "A Fleet operation company has a big variety of car-related services. The car you lease is not only a financial service offering but we are also offering additional services from tire service, breakdown service, repair service, fuel service etc. A whole package for the fleet owner to have a hassle free car use in their company. It is a very broad set of services around a car or a pool-car in the company." (interviewee 3)

Acceptance of car finance and leasing among private and corporate customers is very high. Product sophistication and saturation of the West-European market is also apparent for service-related offerings like maintenance and repair services or established insurance services. Nevertheless, demand for these traditional leasing services is only expected to rise by 4 percent by 2015 (KPMG, 2012). Therefore Western Europe is found to be an active market for new (E)mobility services. Fleet management companies are differentiating into carsharing services, with a potential of 7 to 17 million carsharers (KPMG, 2012). FMCs are increasingly providing mobility services packages, integrating multiple modalities (e.g. for long distance travel). Furthermore fleet management companies also expand their service business with new service platforms and parking management services.

5.2.1 Value Network of Services at Alphabet

Alphabet, a full subsidiary of the BMW group, was established in 1997 and expanded in a rapid pace by acquiring DSL fleet services in 2006 and ING Car Lease in 2011. The company is currently managing a fleet of over half a million cars. Based on multiple expert interviews at the company the value network of services at Alphabet is defined in Figure 15. The value network maps the traditional services of fleet management companies. The integration of financing, leasing, insurance, used car and fleet management services and the range of strategic partners needed for these services. Beside these traditional services, Alphabet is expanding its service offerings with mobility services as a part of the BMW ONE Strategy. Therefore the company introduced a new corporate carsharing service named AlphaCity in 2012, offering the first leasing based corporate carsharing scheme. The corporate carsharing service is currently available in eight countries in Western Europe, and is expanding in a fast pace. By the end of 2015 all European countries in which Alphabet operates are expected to be covered. Furthermore the value network of services shows recent addition of mobility services: AlphaElectric (E-mobility) and AlphaGuide (app) in 2012 and the tight relation with the BMW group.

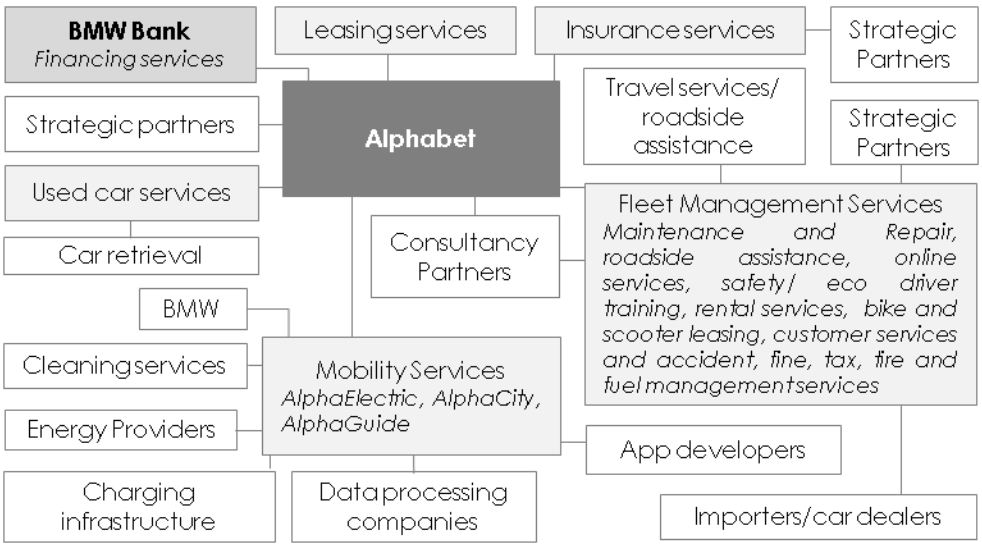


Figure 15: Value Network Services at Alphabet

5.2.2 Value Network of Services at Athlon

Fleet management company Athlon Car Lease, a full subsidiary of the Lage Landen (Rabobank), manages a fleet of 225.000 cars and is especially active in the Netherlands. As well as Alphabet, Athlon Car Lease has also a wide range of financing, leasing, insurance and fleet management services. Recently the fleet management company expended its array of services in the Netherlands and started with consultancy services in 2012. Mobility Consultancy provides services in the area of mobility audits, fleet reviews, mobility scans and an integrated system of mobility management services, see Figure 16. Mobility services are also part of Athlon Car Lease service offerings. In cooperation with P2P carsharing community platform SnappCar it introduced a corporate carsharing service, SnappCar Business in 2013. Furthermore in cooperation with the Dutch railway operator NS a public transport card is offered. This card provides an integrated mobility service of car and public transportation since a couple of years. When studying Athlon Car Lease, the introduction of new services in recent years is apparent. With the introduction of mobility consultancy in 2012 and the extension of mobility services in 2013, Athlon Car Lease currently provides a wider array of services to its customers then before.

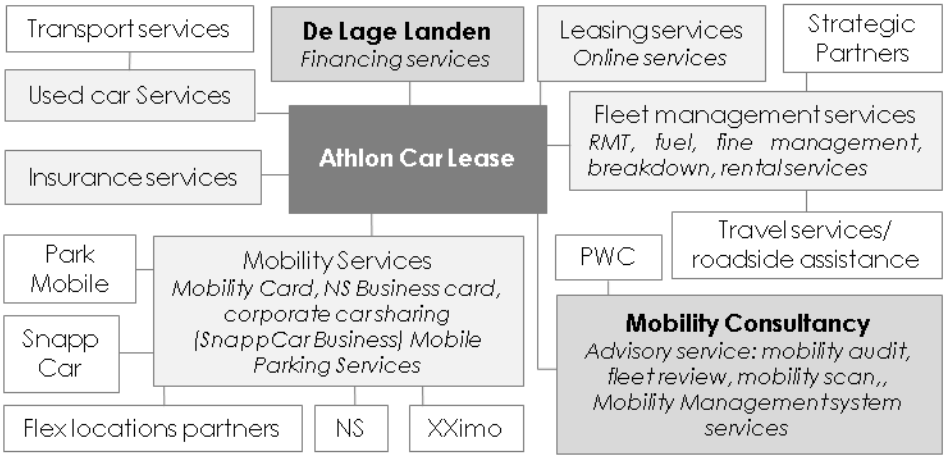


Figure 16: Value Network of services at Athlon Car Lease

5.2.3 Value Network of Services at LeasePlan

Fleet manager LeasePlan has a strong global orientation and is with a fleet of over 1.3 million cars by far the largest of the three. Therefore the company profits from economies of scale and size, for example in their LeasePlan Supply Services. LeasePlan has multiple subsidiaries in various countries in Western Europe, each company addressing the local market needs. In addition to the standard fleet management services, LeasePlan is also active in mobility consultancy services. This service is existent for over a decade in the Netherlands and for several years in Belgium. Although LeasePlan has already an extensive array of services, the company is about to expand its consultancy services on a global scale in 2014. Furthermore, in the Netherlands LeasePlan has two subsidiaries active in mobility services: a multi modal corporate carsharing service (Mobility Mixx) in combination with integrated mobility services (Travelcard). The company aims to develop new integrated services and expand the business geographically in Western Europe. New services which are gaining increasing attention at LeasePlan are related to Telematics services. These services provide real-time information about the status of the fleet. The value network indicates that cooperation with strategic partners is highly relevant for LeasePlan in offering its services, see Figure 17. Furthermore, the value network shows that LeasePlan consists of eight companies, each offering their specific set of services and collaborating with various strategic partners.

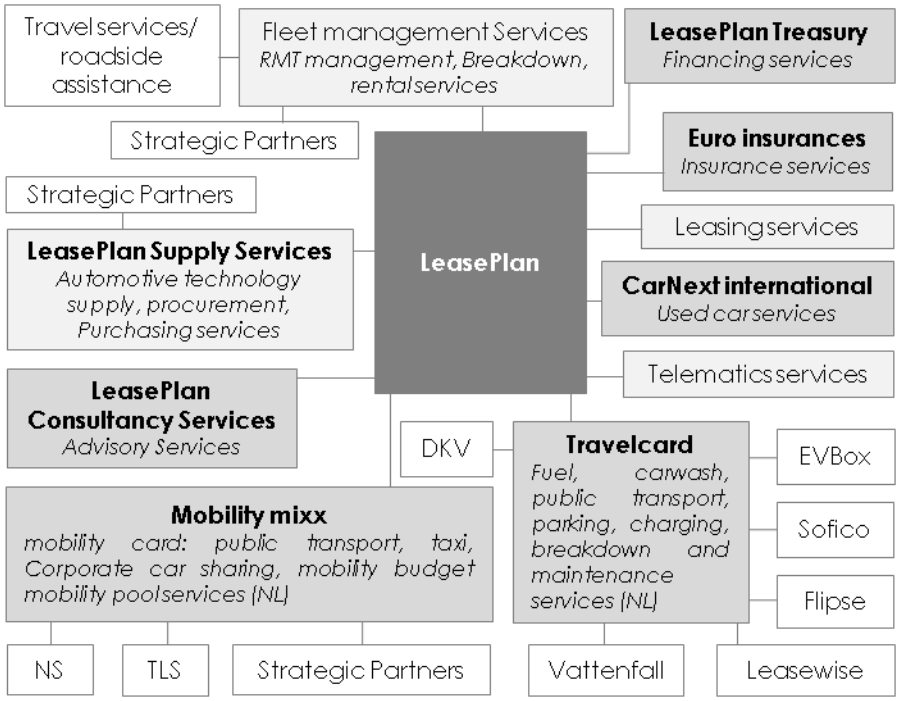


Figure 17: Value Network of services at LeasePlan

Conclusion

Value Networks map the services activities of the four focal companies analyzed in this research. Based on the guidelines posed in the introduction of this chapter, the value networks provide a strong visual overview of the services offered by the company and their cooperation with strategic partners. Analysis of the maps indicates a differentiation into new services in both cases. This marks a transition in value creation with the introduction of connectivity, consultancy, and mobility related services. The Value Networks enable a clear comparison between the cases and therefore provide a sound basis for analysis of the data in chapter 6.

6 Results

The differentiation into services is found to be one of the key phenomena transforming the structure of modern economies. This differentiation was significant for the emergence of a service economy, extending or even replacing product industries. This chapter verifies or falsifies the hypotheses on the transition to services in the downstream activities of the automotive industry posed in paragraph 2.4. As described in paragraph 3.3, Atlas TI is used to code and analyze the data of the interview transcriptions. For most hypotheses a *network view* and a *co-occurrence table* is provided using Atlas TI, mapping the specific relations between the *codes* associated with the hypothesis. The first number in the brackets next to the *codes* in the *network view* refers to the *groundedness, t*he second refers to the *density* of the code. See Table 7 for an overview of the coding families used, a network view of the super codes and their co-occurrence in the data. Hypothesis 1 is answered by analyzing the fleet management companies (case FMC) in paragraph 6.1 and hypothesis 2 is answered by analyzing the data of the OEM (case OEM) in paragraph 6.2. Paragraph 6.3 discusses hypothesis 3 and 6.4 hypothesis 4, using data from both cases. The data was analyzed following the process of analytic induction in paragraph 3.3. After the hypothesis is presented a brief description is provided of the approach and the tools used. Afterwards an investigation of the evidence that is supporting the hypothesis is provided followed by the evidence not supported by the hypothesis. Resulting in a discussion of the evidence and a verification or falsification of the hypothesis. Finally, paragraph 6.5 answers research question 4.

RQ 4. *How do actors add value in the downstream activities of the automotive industry in the future?*

For answering this question, a future vision of the downstream activities in the automotive industry is formed by analyzing the two cases in a cross case analysis. In each paragraph quotations are used to clarify the research by providing a rich context.

6.1 Differentiation into services

Three fleet management companies were analyzed in order to answer the first hypothesis posed in paragraph 2.4. Hypothesis 1 was applied to verify the differentiation into services at fleet management companies. In Atlas TI a global Filter (*Coding Family Case FMC)* was used, selecting the data of 9 interviews at fleet management companies.

Hypothesis 1: *Increasingly value is added by downstream activities of Fleet management companies in the automotive industry due to differentiation into services.*

The analysis started with the investigation of codes related to differentiation into services. This can be identified in the statements related to the importance of services and (the increase of) new services. Therefore, the codes New Services (Super Code: **New Services*), the increase of new services (Code: *New Services: Increase*), the Importance of Services (Super Code: **Importance Services*) and the transition into differentiation (Code: *Transitions: Differentiation*) are analyzed. The resulting network view of these codes, retrieved from Atlas TI, showed a relative high groundedness and density of the first three codes, see Figure 18. This indicated these codes were used reasonably often in the data, supporting the relations posed in the hypothesis. Table 9 shows the co-occurrence of the codes in the data of the FMC case. The (increase of) new services had a high co-occurrence with the other codes associated with hypothesis 1. The data showed also the acknowledgement of the importance of services.

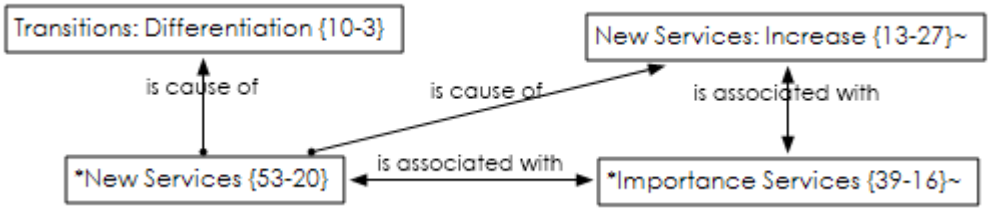


Figure 18: Network view of New Services, Importance of Services and Differentiation

Table 9: Co-occurrence New services

	*Importance Services	*New Services	New Services: Increase	Transitions: Differentiation	TOTALS
*Importance Services		4	4		8
*New Services	4		11	4	19
New Services: Increase	4	11		1	16
Transitions: Differentiation		4	1		5

The analysis of the case showed that fleet management companies have services as their core business. These companies provide a large service value in Use oriented (lease, sharing and pooling) and Result oriented services (activity management, pay per service unit and functional result) following the layers of the PSS, see paragraph 2.2.2. The study indicated Product lease (car leasing) as the central service of a fleet management company.

> "The core business of a Fleet Management company is the integration of activities and the provision of a care free service package for the customer. The current leasing product is actually an example of the integration of activities, the core is car financing, surrounded by services as maintenance and insurance etc. Mobility services are also the bundling of activities, only the circle of activities is extended. Addressing to the needs of a large customer group by replacing the responsibility from employer to employee with a mobility budget" (interviewee 1)

As seen in the value network maps in Figure 15, 16 and 17 of chapter 5, the range of mobility services was extended in recent years. Beside the carsharing services, fleet management companies are also expanding their package of mobility services in other directions.

> "With AlphaCity we have just have placed on top the ability of offering a carsharing scheme, which is another service in the big service package of a fleet manager. (..) We are also planning new services around corporate mobility, at AlphaCity we have now launched a shared drive initiative. People who are using our car, are also offered to share their ride and also reserve their shared ride. I think the whole industry is developing in the right direction of offering broader mobility services instead of just offering a leasing services. Each market in Europe has different needs and different maturity on customers accepting such services or not. We are working in different areas to develop further corporate mobility services besides pure car mobility."(interviewee 3)

Table 10: EP/PSS Matrix Fleet Management Companies

Fleet Management Company		**Alphabet**				**Athlon**				**LeasePlan**			
Product Content / Service Content		Tangible Product	Support Services	Differentiating Services	Product as a Service	Tangible Product	Support Services	Differentiating Services	Product as a Service	Tangible Product	Support Services	Differentiating Services	Product as a Service
Product	Product related services												
	Advice and consultancy												
Use	Product lease												
	Product renting/sharing												
	Product pooling												
Result	Activity management												
	Pay per service unit												
	Functional result												

Analysis of the fleet management companies showed that they are in a transition to offer a care free package of integrated mobility. Table 10 provides an overview of the EP/PSS matrix for the three fleet management companies studied based on the template of Table 3. The darkness of the rectangle resembles the level of value addition of the service. The table clearly shows core activity of service providing in product lease and activity management. Figure 19 maps the gradual transition of the Use orientation to a Result orientation in recent years. Where each dot per type of PSS represents one of the three FMCs investigated in this research.

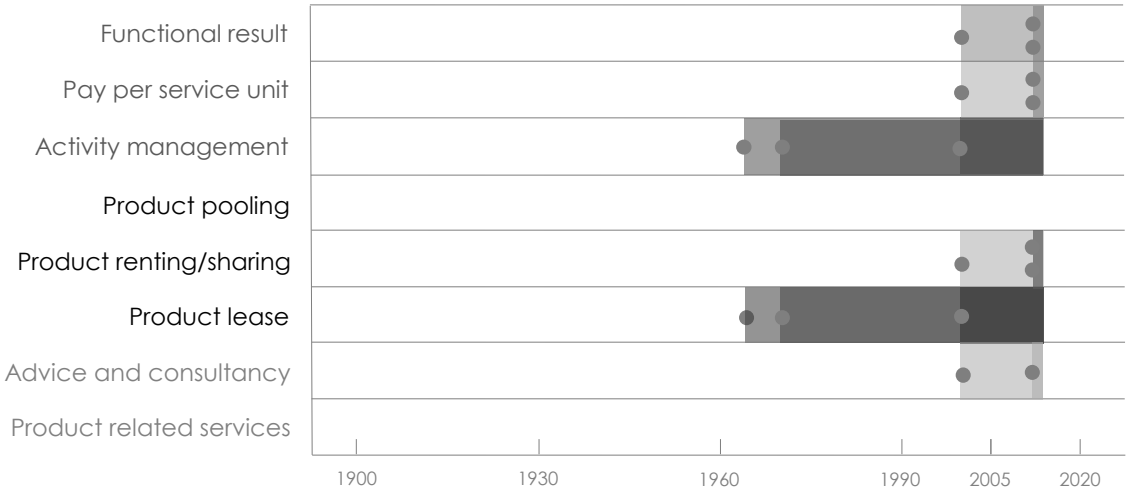


Figure 19: Transition to services at three fleet management companies combined

Conclusion

Following the data analysis of paragraph 3.3, the data showed consistent evidence. This verified hypothesis 1 on the differentiation into services by fleet management companies. Quotations related to new services appeared multiple times in the data of the FMC case. The code New Services had a co-occurrence of 19. This indicated that this code was applied 19 times in the same quotations related to codes associated with this hypothesis. Also the code related to the increase of new services showed a high co-occurrence. The code that identified a Transition due to differentiation had a low co-occurrence. By analyzing the associated comments this had merely to do with the limited groundedness due to the specificity of the code *Transition: Differentiation*. Table 10 showed that most of the value is added today by the traditional services in product lease and activity management: financing, leasing, insuring and fleet management services. The data showed a strong relation between the codes investigated for the FMC case. Therefore, there can be concluded that the hypothesis about the value addition of fleet management companies due to the differentiation into services was confirmed. FMCs are increasingly differentiating into new services related to consultancy and mobility. Figure 19 indicated that little differentiation into services related to product pooling (ridesharing) has taken place at fleet management companies. Therefore, this type of the Use-oriented PSS could be a potential new service and a new source of value creation in the future.

6.2 Increasing focus on services

To answer the second hypothesis the value creation of Extended Products was explored by studying BMW, see paragraph 2.2.3. Complementary to hypothesis 1, hypothesis 2 investigated the transition to services at an OEM (Global Filter: *Coding Family Case OEM*) by identifying the importance of Extended Products and relating it to an increase of new services.

Hypothesis 2: *Extended Products are increasingly important for value creation in the downstream activities, as a result the OEM is increasingly focusing on services.*

Currently the primary source of profit in the highly competitive OEM market is still the sale of cars and spare parts with a strategy of mass production. Interesting to see is that the current business model does lack profitability since it does not catch most of the earnings associated with the use phase of the car (Godlevskaja, van Iwaarden, & van der Wiele, 2011). The analysis showed that the OEM is therefore increasingly exploring service opportunities. The analysis investigated the association between Extended Products (Code: *Extended Products*), new services (Super Code: **New Services*) and the importance of services (Super Code: **Importance Services*). This results in a network view which maps the relations between the nodes, presented in Figure 20.

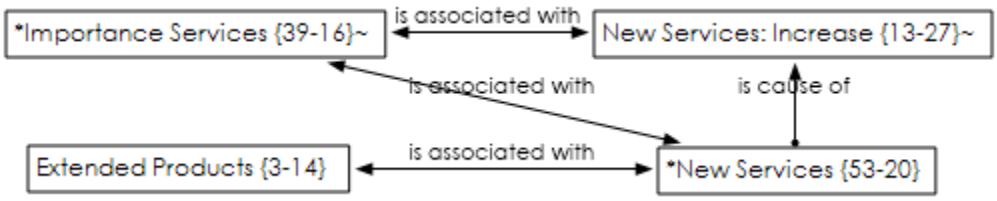


Figure 20: Network view of Extended Products and increasing attention to services

The network view shows that although the concept of Extended Products (EP) was not grounded very well in the quotations, it was strongly associated (high density) with (new) services. This code, in its turn was strongly linked to the importance of services, and an increase in the number of new service offerings. Table 11 shows the relatively weak co-occurrence of Extended Products and an increase in services with the importance of services and new services. This was apparent since the quotations indicated the high importance of services for the OEM. That is explained by the restricted amount of data used in this case. Although the automotive industry is traditionally product (goods) oriented, the analysis of the data did reveal a transition to services.

Table 11: Co-occurrence EP

	*Importance Services	*New Services	Extended Products	New Services: Increase	TOTALS
*Importance Services		3	2	1	6
*New Services	3		1	2	6
Extended Products	2	1		1	4
New Services: Increase	1	2	1		4

> "Our core business is individual mobility. As things developed, services have become much more important for our customers, especially premium customers. So we will have to develop our services along with the development of our core product. So services have become important and will be even more important in the future." (interviewee 5)

Although the OEM is still product driven, investigation of the quotations in the data showed that BMW focuses increasingly on the downstream activities of the value system. This enabled the company to capture a significant portion of the after-sales, maintenance, and repair business through their sales network. The OEM incorporated profitable activities in downstream activities as customer services and financial services. Customer contact, information and image have become decisive factors for success in brand competition. Therefore the perception of what value should be offered by an OEM changed.

> "The BMW group states that premium mobility is our core business. This means products and services, over the years services did have become part of the offerings. Nowadays services are an important differentiator in value creation for the customer" (interviewee 2)

BMW values the growing importance of services to differentiate and fulfill customer demands of premium mobility. According to the OEM the customer is increasingly demanding service packages during the use phase of the car.

> "Services are vital for BMW, because the customer wants it. If you want to sell your products you need to make sure that you offer the customer what he or she wants. The customer orientation has changed to new technology, sustainability and of course we adapt our product offerings and service offerings to the customer needs." (Interviewee 5)

BMW is an innovative frontrunner with in their strategic future vision: Number One. The OEM expanded its focus on selling products with services, see the Value Network of services at BMW in Figure 14. By introducing connectivity and mobility services the OEM is increasingly selling Extended Products.

> "For BMW to maintain control over the cooperation with corporates, dealerships and fleet management companies is key to be successful in the services business. In fact we sell 70% of our cars as a service" (interviewee 2)

With the launch of sub brand BMW *i* mobility is an integral part of BMW. Analysis of the data indicated that the OEM is moving to offer car-independent premium mobility services. With BMW *i*, the OEM aims to provide customized E-mobility solutions across a value network of premium products and services (LBS, intelligent navigation systems, intermodal route planning and carsharing), see Appendix G. The analysis showed that services are key to overcome the barriers associated with E-mobility, therefore BMW is offering an integrated service package with 360˚ Electric. One of the most important factors in the success of BMW's mobility services is the use of ICT technology to offer fully automated mobility services.

> "Services are especially important for E-mobility since there are still many questions on the customer side. A new technology is not something that finds a direct way to the customers. We are trying to answer all those questions and provide the customer really the insurance that you can get a care free package from us. We are thinking about everything, all your concerns, and the answer is 360˚ Electric." (interviewee 5)

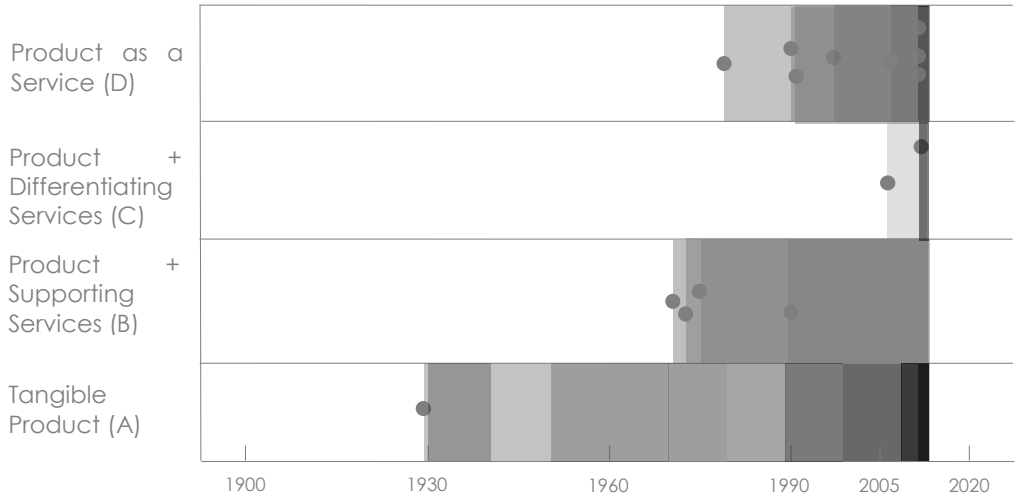


Figure 21: Transition to services at BMW

Table 12: EP/PSS Matrix of BMW

		Tangible Product	Support Services	Differentiating Services	Product as a Service
	Product Content / Service Content				
Product	Product related services	■	■		
	Advice and consultancy		■		
Use	Product lease				■
	Product renting/sharing				■
	Product pooling				
Result	Activity management				■
	Pay per service unit				■
	Functional result			■	■

The transition to services can be visualized in a graph by mapping the levels of the Extended Product concept over time, see Figure 21. The figure shows the year of introduction of the services at BMW (grey dot) and makes clear that services are merely introduced from the 1970s on with BMW Financial Services. An increase in differentiating services (layer C) and Product as a Service (layer D) is visible in the last decade. Due to the introduction of BMW DriveNow (carsharing) and BMW *i* the company is moving into innovative mobility services, see Appendix G. Beside the differentiation into services also a differentiation into products is visible in layer A. The product range expanded rapidly offering car models in every new niche. The service transition is also mapped using the EP/PSS matrix described in paragraph 2.2, see Table 12. The table provides a detailed overview of the types of services and layers of the Extended Product the company is currently active. The services are ranked based on the criteria of Table 1 and 2 of paragraph 2.2. Product oriented services are still important for an OEM as BMW combined with the Use oriented services of product leasing in the financial services division. But there is an increasing attention for differentiating services and Product as a Service orienting more on product renting/sharing (Use) and Result.

Conclusion

To conclude, the analysis of this hypothesis was not so much based on the coding in Atlas TI, a stable foundation was found in the desk research and interview quotations of the OEM case. By mapping the services, in Figure 21 over time and in Table 12 on their service level and orientation, a detailed insight was provided in the expansion of Extended Products. This analysis identified the transition to services offerings at BMW and therefore verifies hypothesis 2, stating that Extended Products are increasingly important for value creation at the OEM.

6.3 New Actors

Since hypothesis 1 and 2 are verified, hypothesis 3 can be analyzed for both cases combined. Value is created in new service offerings of the downstream activities of the automotive industry, the consequence of this with regard to new actors was analyzed in hypothesis 3.

Hypothesis 3: *New actors enter the downstream activities of the automotive industry to increase value creation due to new services offerings.*

The case study showed that BMW is a leader in innovation, see paragraph 5.1. The company is focusing on the mobility of the future with well thought out products combined with complete service packages for individual mobility. As a consequence, BMW is expanding its range of strategic partnerships with high-tech companies related to developments in e.g. connectivity and LBS. Therefore BMW established a venture capital company in 2011, see Appendix G.

> "If you want to be a leader in innovation you need to be capable in all the new technologies and therefore it is smart to cooperate with other leading innovation partners which offer new technologies. That is also the reason for example why BMW founded BMW *i* Ventures: to have easy access to the startup companies." (interviewee 5)

The analysis indicated that BMW is able to answer to the transitions in the automotive industry, by expanding their range of strategic partners.

> "We have to become a high-tech company ourselves, we have acquired a fleet operator, Alphabet. We have expanded our roam on that field, strategic partners are chosen on the field of activity." (interviewee 5)

The data in the case of FMCs showed that new competitors enter the market of mobility providing, e.g. public transport operators and OEMs. The analysis showed that number of new competitors will expand since new services are offered, each planning to grasp a piece of the mobility pie.

> "Competition is everywhere, travel (rail) industries like Deutsche Bundesbahn are pushing into the mobility services market, OEMs entering the mobility services market or fleet management companies are also offering such services. So it is a trend which all companies have to face. Everybody is doing this because there is an ongoing change we have to face. So competitions are very broad, not only direct competitors in the leasing business but also other mobility related companies and also companies who are offering services on the web related to transportation. So it is about who is offering a broad bouquet of mobility service, that is more or less the objective. The other industries are focusing on this market." (interviewee 3)

Companies have to establish strategic alliances, vertically and horizontally when the requirements needed to offer these new services are not part of the core competences (Kandampully, 2002). The case study also indicated that other modalities (beside the car) are not the core business of FMCs. Inherently cooperation with other actors, mostly outside of the automotive industry is increasingly important.

> "Cooperation with strategic partners will increase, especially in mobility services. Since we are not a mobility company, or a public transport company, these should be done by other companies."(interviewee 7)

Due to the technological developments new services can be offered. This makes cooperation with strategic partners increasingly valid. The automotive companies which can organize long-term collaboration partnerships with other actors in or outside the automotive industry will profit.

> "We think that every modality can be developed further to a large extend. Servicing other modalities like the bike or train is to a large extend depend on strategic partners who offer these modalities, which can be a downside. When we are able to find strong resourceful partners with a high service standard we won't hesitate to cooperate, and I think this will increase in the future". (interviewee 4)

The data showed that new services require cooperation with new partners. For example with network operators (provide the communication infrastructure) and content providers (generate and provide content) (Hoffmann & Leimeister, 2011). In Table 13, the data on new services and new actors is analyzed. The co-occurrence table shows the tight relation between the two concepts and the high representation of the OEMs, strategic partners and new competitors as new actors related to the new service offerings.

Table 13: Co-occurrence New Actors-New Services

	OEM	Strategic Partners	Competitors	Financial Services	Platform Providers	Public Transport Operators	Importers	Building Companies	Mobility Providers	Energy Companies	Consultancy Companies	Fleet Managers	Insurance Companies	Telecom Companies
*New Actors	9	7	6	4	4	4	2	2	2	2	1	1	1	1
*New Services	10	8	6	5	4	4	3	2	2	2	1	1	1	1

Analysis of Table 13 identified the high level of co-occurrence of new actors and new services which indicated that new services are offered by the new actors. Especially OEMs, new strategic partners and direct competitors are named as actors offering the new services. Carsharing and mobility services are named as new services, see Table 14. Furthermore the data indicated potential new services in mobility integration and advisory services. The four concepts associated with hypothesis 3 were analyzed for their co-occurrence, see Table 15, and mapped in a network view, see Figure 22. The network view indicates that the transitions in the market (Super Code: **Transitions*) cause the introduction new services offerings (Super Code: **New Services*). New Services cause in their turn New Actors to become part of the automotive industry (Super Code: **New Actors*) which is expected to increase cooperation (Super Code: **Cooperation*). Table 16 provides a detailed insight in the transitions, indicating that the transition in the core business, mobility providing, technological developments and creating awareness are most relevant.

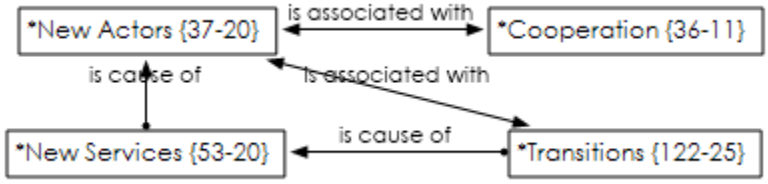


Figure 22: Network view of New Actors, Cooperation and New Services

Table 14: Super Code New Services

	Carsharing	Mobility	Mobility Integration	Consultancy	Platform	Applications	EV	Ride Sharing	Telematics
*New Services	16	9	4	4	2	1	1	1	1

Table 15: Co-occurrence New Actors

	*Cooperation	*New Actors	*New Services	*Transitions	TOTALS
*Cooperation		8	9	12	29
*New Actors	8		12	13	33
*New Services	9	12		15	36
*Transitions	12	13	15		40

Table 16: Super Code Transitions

	Core Business	Mobility Provider	Technological Developments	Creating Awareness	Ownership-Usage	Differentiation	Customer Needs	Extended Products	B2B/B2C	Innovation	Mobility market	Markets	Market Flexibilization	Responsibility	Collaborative Consumption	Connectivity	Flexibilization Value Chain	Others
*Transitions	17	13	13	13	11	10	9	7	7	6	6	6	4	3	3	3	2	6

Analysis of the data showed that the introduction of service oriented business models and technologies changes the automotive value system. The expansion of mobility services brings more actors in the automotive industry. For instance, Energy utilities and ICT companies which are cooperating with OEMs due to technological developments in E-mobility (Makela & Pirhonen, 2011). Also IT providers, start-ups and insurance, infrastructure and public transport companies are new actors which traditionally work autonomously outside the traditional automotive value system (Gyimesi, Schumacher, Diehlmann, & Tellouck-Canel, 2010) (Jing & Ziong-Jian, 2011).

Conclusion

The four constructs were analyzed for their co-occurrence in the data, see Table 15. The data analysis showed a strong resemblance among all of the codes. This indicated a relationship between new services and new actors, which is associated with increased cooperation. Table 14 indicated that new services were mainly geared to carsharing and mobility. New actors in this area were indicated to be OEMs who diversify in their service offerings with their financial services division and new strategic partners as energy utilities and ICT companies and platform providers, see Table 13. These developments caused transitions in the core business of FMCs and OEMs. The analysis showed that the nature of the transitions which change the value network is very wide, see Table 16. Most relevant is the transition of the core business of the company. The FMCs make a transition to integrated mobility provider and the OEMs become a premium provider of individual mobility. These transitions are related to technological developments and the transition from ownership to usage. The creation of awareness and differentiation are key to answer the changing customer needs. Based on all the evidence stated above hypothesis 3 was clearly verified in the data: new actors enter the downstream activities of the automotive industry to increase value creation due to new services offerings.

6.4 Value Network

Following on the previous hypotheses, the final hypothesis highlights the influence of the transitions indicated in Table 16 on the value network. In service value networks, value is created by a focal company through cooperation with multiple actors, see chapter 5. Through networking, companies can acquire new competences that drive these service transitions. As stated in paragraph 2.5, a shift in the value network is often linked to service innovation. This is due to the fact that companies need to renew themselves and develop new strategies, knowledge for service development and gain access to new markets (Henneberg, Gruber, & Naudé, 2013). The value network was analyzed to answer hypothesis 4, identifying the influence of the transition to services on the value system.

Hypothesis 4: *Service transitions influence the value system structure of the automotive industry.*

The analysis started with the investigation of the constructs from hypothesis 4. The data analysis indicated that these can be identified in the quotations related to transitions, new services and the changing value network. Therefore, the relation between the codes Transitions (Super Code: **Transitions*), New Services (Super Code: **New Services*) and Changing Value Network (Super Code: **Changing Value Network*) are analyzed. The resulting network view of these codes, retrieved from Atlas TI, shows the relation between the codes, see Figure 23. Table 17 shows an considerable co-occurrence of the three constructs in the data associated with hypothesis 4.

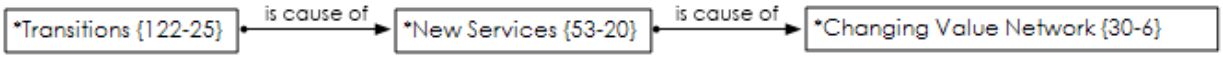


Figure 23: Network view of Transitions, New Services and the Changing Value Network

Table 17: Co-occurrence Changing Value Network

	*Changing Value Network	*New Services	*Transitions	TOTALS:
*Changing Value Network		4	11	15
*New Services	4		15	19
*Transitions	11	15		26

As the analysis in paragraph 6.3 showed, OEMs and FMCs form strategic partnerships with multiple new actors to develop business models that can succeed in this changing environment. These new actors become part of the automotive value system and are willing to take the lead in developing and profiting from new mobility solutions. As a result the value system becomes more interconnected and networked. Cooperation is critical and finance will increasingly play an important role because new alliances are established between the actors in the downstream activities. The automotive industry will be reshaped in the upcoming years by perceiving a car as a mobility product where the car itself represents just a piece of the holistic mobility package (Kostic & Jovanovic, 2012). Therefore fleet management companies increasingly maintain a network structure of coopetition.

> "Being a part-time competitor is what makes us interesting. We can offer a car on a leasing based service and we are an one stop shop. Besides the traditional services we also offer consultancy services. We have to show to customer that we are making the transition from car leasing and fleet management to mobility management." (interviewee 4)

To gain insights in what influences the changing value network, the value network was analyzed in more detail. A shift in the value system is often linked to new services because companies need to renew themselves and develop new strategies for service development (Henneberg, Gruber, & Naudé, 2013).Figure 24 forms the network view of the constructs associated with a changing value network. The data analysis showed that a value network can provide competitive advantages. Companies extend their services within a service network this enables the provision of a wide range of services (Gebauer, Paiola, & Saccani, 2013). In the changing value network, value is increasingly created by cooperation of multiple new actors with different core competences, see Table 13. Furthermore, the value network structure influences the strategic partners of actors, their company position in the automotive industry and the core business of the FMCs and OEMs. Through networking companies can acquire new competences that drives the transition to services. Table 18 shows that especially the company position and strategic partners have a strong co-occurrence with the changing value network. This indicated that the position of the actors in the downstream activities and the range of their strategic partners are altered by the dynamics in the value network.

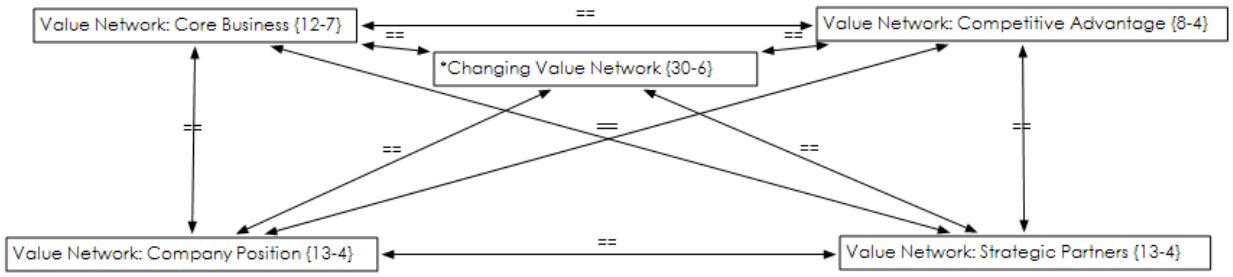


Figure 24: Network view of the Changing Value Network (== is associated with)

Table 18: Co-occurrence Changing Value Network (VN)

	*Changing Value Network	VN: Company Position	VN: Competitive Advantage	VN: Core Business	VN: Strategic Partners	TOTALS:
*Changing Value Network (VN)		13	8	3	13	37
VN: Company Position	13		2	2	2	19
VN: Competitive Advantage	8	2		0	0	10
VN: Core Business	3	2	0		1	6
VN: Strategic Partners	13	2	0	1		16

As already shown in the value network analysis in Figure 14, 15, 16 and 17, the value network extended due to the introduction of new services. Strategic partners are increasingly important since not all services can be performed in-house. Especially for connectivity and mobility services cooperation is key. The analysis showed that the nature of the transitions which change the value network is very wide, see Table 16. Most relevant is the transition of the core business of the company. The fleet manager makes a transition to integrated mobility provider and the OEM becomes a premium provider of individual mobility. These transitions are related to technological developments and the transition from ownership to usage. The creation of awareness and differentiation are key to answer the changing customer needs.

Conclusion

The analysis indicated that due to transitions, related to e.g. the core business, mobility providing and technological developments, new actors and new services become part of the automotive industry. This causes the downstream value system to change. Due to integration of mobility and technologies the value system of downstream activities of the automotive industry is expanding. Therefore the industry becomes increasingly networked: former competitors need to cooperate to offer integrated services and new actors enter the downstream activities of the automotive industry to offer new services. The value networks of the companies identified in the cases were designed to identify their service portfolio and the value creating network of strategic partners. As stated in Paragraph 2.3, value networks take businesses into a competitive domain where competition shifts from the company level to the network level. The focus on a downstream value network was suited since value for the end-customer is co-created by a combination of (new) actors. By indicating the downstream activities as a value network the significance of relationships between the companies involved was highlighted. By looking at the value creation process of a service an overview was established of how the roles were divided for different configurations of services. This resulted in a confirmation of the final hypothesis as well. Hypothesis 4 stated that service transitions influence the value network structure.

6.5 Value creation

This paragraph aims to answer the fourth research question by investigating how value will be added by the actors in the downstream activities in the future. Today 60% of the revenues and 80% of the profit of a car over lifetime originate from downstream activities, i.e., finance, insurance, maintenance, repair and fleet management (Dannenberg, 2005). In response to the decreasing value creation, services came into play as a source of value creation several decades ago, see chapter 4. In Western Europe leasing became an important new service due to the emergence of both fleet management companies and financial services divisions of OEMs. Still the automotive industry is a fairly traditional product driven industry with long product development cycles.

Table 19: Co-occurrence Trends

	Urbanization	Generation Y	New Way of Working	Sustainability	Mobility Integration	Others	TOTALS
*Trends	12	9	4	3	3	2	33
*Transitions	6	7	2	2	1	1	19

In order to discover the future transitions, trends are investigated to provide a future vision. In the data trends are coded (Super Code: **Trends*), see Table 19. Especially urbanization and the new generation are named as trends causing transitions. Urbanization is the trend of people moving to the cities, and therefore a car is less useful due to limit parking spaces, availability of shops, costs, excellent public transport etc. Generation Y is said to be less inclined to own a car, marking the transition from ownership tot usage. This makes new services as carsharing increasingly important. Therefore BMW is heavily investing in technological developments with the BMW *i* sub brand. The BMW *i* mobility concept adds value by the expansion of services with the introduction of mobility services and connectivity services, see Figure 14. This is done in cooperation with application developers and telecommunications companies. Value is increasingly added by the car related services or Extended Products offered by BMW, see paragraph 6.2. The transition in value addition at the OEM is in accordance with to the transition from a products orientation to a service orientation, see paragraph 2.2. Due to the attention for services, the financial services division is increasingly important.

> "Financial Services divisions are increasingly important for two reasons. First, we need to be able to finance the cars ourselves, it is an important strategic growth for every OEM, also for BMW. Secondly the FS takes over the role of the traditional banks by competing with the banks. This is visible in all industries: experts in finance who know the business, the associated risks and have a good relationship with the manufacturer and therefore know the situation and are able to take the risks together." (Interviewee 2)

As seen in paragraph 6.1 and 6.3 Fleet management companies feel the pressure to change their core business of financing cars for companies combined with fleet management services. Offering financing, leasing, insurance and fleet management services is found to increasingly become a commodity with declining profit margins. This boosts the need to answer the customer demand to offer new services. Corporate customers are increasingly demanding mobility services and carsharing services to reduce TCO and for sustainability reasons. The fleet management companies are gradually expanding into consultancy and mobility services, evolving into integrated mobility providers.

> "Our current position in the market is that of an international actor in car leasing in ten countries in Western Europe. We are moving to become a sustainable mobility provider, this is a slow transition, starting in the Netherlands and Belgium." (interviewee 1)

The transition in value creation is visible in the increasing attention for consultancy services at fleet management companies. There is an apparent parallel visible between the transition to full operation lease fifty years ago (integration of all services related to car leasing) and the current transition to becoming mobility providers (integration of all modalities in one service package).

> "Back then fleet management companies became involved who bundled the activities, and operational leasing became a common formula. It was actually plain ease of use that fostered the combination of these services. What you see now is mobility leasing, leasing several modalities, by combing these mobility services a new service package is offered. Actually you could say this is operational leasing vol. 2. The development is really similar, combing the separate services in operational leasing and today you have all these separate mobility services who are bound to become one service, but this will take time."(interviewee 7)

As another interviewee stated, this transition is much more complex since the company steps out of the car 'box' and into the public transport 'box' by combining multiple modalities. But this transition is needed to be able to be of added value as a company in the future. The integration of mobility and modalities is found to be a key step in the future for fleet managers, who are moving to become mobility providers.

> "We are moving to another way of thinking about mobility and ownership. As a company you have two choices. Or you join the transition, with the consequence of selling less leasing contracts, but it that case you are part of the transition to new mobility. Or you don't, so ownership stays the same, but in that case reality will pass you by. Other companies will offer what the customer demands and you won't be able to join. In that case you will lose your classic leasing revenues but you won't have an alternative either. So the best choice is clear, join the transition to mobility services." (interviewee 9)

The maturity of these services is high in the Netherlands. Mobility consultancy services are offered for over a decade, and are currently expanding to a global scale. The consultancy services are important to answer the client needs, which are increasingly requiring insights in the mobility costs which account for 20% of total company costs. An important reason to incorporate carsharing services is to reduce the TCO of mobility. Therefore carsharing is a new service which is gaining increasing attention: Alphabets corporate carsharing service is rapidly expanding in Western Europe. Due to new technologies as NFC and telematics the ease of use for this category of services is greatly improved, which is a key factor for the success of the service. The Netherlands is considered a front runner in mobility services compared to other countries, therefore the transition to mobility is said to be most visible in the Dutch B2B environment. Governmental regulations and geographical factors and population density create a perfect climate for E-mobility. Therefore the Netherlands can be seen as providing a flagship role in the future for other markets. The mobility services are partly enabled by the introduction of the public transport chip card, using an automated payment for public travel. This enhances the ease-of-use and paves the path to mobility integration. The card can form a key source of value creation for the fleet management companies in the future. For the support of new ownership models like PAYD and carsharing, financing will be of crucial importance. Responding to the future trends of urbanization and the customer needs of generation Y.

Cross case analysis

The two cases can be compared using a *Codes-Primary Documents Table* in Atlas TI, counting quotations per code or code family in the data set. Table 20 shows the number of quotations per code family for the two cases, representing how much is talked about a subject. The 12 code families represent 65% of all quotation codings. Due to the difference in number of interviewees (nine to two) the number of quotations per case differs substantially.

Table 20: Cross case analysis number of quotations per code family

	Transitions	Importance Services	New Services	Markets	Cooperation	Value Network	New Actors	Services	Integration	Trends	Reasons Mobility Services	Reasons Car Sharing	Totals
Case FMC	82	15	38	45	23	18	28	24	25	22	12	4	336
Case OEM	28	23	13	11	11	10	6	7	3	4	0	0	116
Totals:	110	38	51	56	34	28	34	31	28	26	12	4	452
Case FMC	24%	4%	11%	13%	7%	5%	8%	7%	7%	7%	4%	1%	
Case OEM	24%	20%	11%	9%	9%	9%	5%	6%	3%	3%	0%	0%	

The cross case analysis indicated the most important difference between the two cases is that the data of the OEM case shows much more attention for the importance of services compared to the fleet management companies' case, see Table 20. This can be partly explained by the fact that the OEM is increasingly focusing on services, therefore the importance of services raises, as seen in paragraph 6.1 and 6.2. Opposite to OEMs, fleet management companies are service companies making the importance of service a logical part of their core business. Relevant is that the fleet management companies seem to value integration highly, based on the substantial number of quotations. Also they state much more often the entrance of new actors. Increasingly fleet management companies foresee integration as part of their future business model. Most of the other important code families show a high level of similarity in percentage of quotation. Showing a similar attention to these subjects. Especially the high number of quotations on transitions in both cases is apparent. This indicates that a change is underway impacting the downstream activities of the automotive industry. Analysis of the data of the cases indicated that the actors add value in the future in the downstream activities of the automotive industry in the future by differentiation into services, see Table 14. According to the data this caused a transition in the value creation structure of the automotive industry, which becomes a value network.

7 Conclusion & Discussion

The chapter starts with a discussion of the scientific relevance of this research followed by an outlining of the practical relevance in paragraph 2. The third paragraph list respectively the limitations and suggestions for future research. Practical recommendations are provided in paragraph 4. The final paragraph starts with a recuperation of the main findings and by stating the conclusion the main research question is answered. The findings in previous chapters serve to answer the main research question.

Main Research Question: How is the value creation structure of the downstream activities in the automotive industry influenced by the transition to services?

The research indicated that value will increasingly be added by actors in the downstream activities of the automotive industry through diversification into services. The value structure becomes more networked, due to increased cooperation with strategic partners. This results in an extended networked automotive value system.

7.1 Scientific Relevance

Traditionally the value chain framework by Porter (1985) is used to identify the activities of suppliers in the automotive industry. As a consequence, actors in the downstream service activities of the automotive industry are underexposed. This is apparent, due to the fact that the automotive industry shows increasing interest in the downstream activities. These service activities are increasingly retaining a large share in the total value creation, since services increasingly form an important way of differentiation. Therefore the first part of this study contributed to the small array of existing literature on transition to services by Vandermerwe & Rada (1988) and Vargo & Lusch (2008). Hypothesis 1 and 2 were formulated to investigate the transition to services. These hypotheses stated that services are increasingly important for value creation in the downstream activities of the automotive industry. Services were identified by combining the concept of Extended Products of Wiesner et al. (2013) with the Product-Service System typology of Tukker (2004) and Williams (2007). A service matrix was developed describing whether the layer of the Extended Product (EP) is Product oriented, Use oriented or Service oriented (PSS). This matrix enables to identify in detail the type of service and the layer of Extended Product at the fleet management companies and the OEM, see Table 10 and 12. This tool adds to the scientific knowledge on this subject by providing a detailed map of the transition to services. The analysis showed that Product as a Service (PaaS) is the core business of fleet management companies, with their traditional business of car financing and leasing. Recently, new services are added by differentiation into consultancy and mobility services. Simultaneously an integration of mobility solutions takes place. FMCs become integrated mobility providers by offering a multi-modal service package and new business models. OEMs can realize advantages in value creation over pure service providers when they diversify into Extended Products. OEMs have the potential to profit from the transition to services since they offer products characterized by complexity, technological innovation and customization. OEMs remain to have the production and development of cars as their core business. But they expand their value creation structure by selling their Products as a Service. For BMW, the diversification in EPs is apparent with the introduction of (E-) mobility services and connectivity services.

The automotive industry has experienced multiple transitions in the value system in the past. In order to provide context for the transitions in the future, the causes of the changes in the value system in the past are indicated. Till the 1930s, the automotive industry was going through major changes in value creation due to technological developments. Supporting services became increasingly important with the introduction of new in-car features, luxury and personalization options. Due to the introduction of rental services, Use-related services became gradually part of the automotive industry. World War II had another structural effect on the value system of the automotive industry. It caused bankruptcy of multiple small traditional luxury car companies. Supported by governmental regulations, increased wages and suburbanization car sales increased rapidly in the 1950s. The fleet management companies introduced leasing and fleet services in Western Europe in the 1960s. This expanded the range of Use-oriented services and imposed a structural change on the ownership structure, by selling the Product as a Service. OEMs followed with an extension of their services with the introduction of Financial Services divisions in the 1970s. Another structural change was caused by the transition to a customer driven market in the 1980's as a consequence of overcapacity, wider choices, increased product quality and sophisticated consumer demand. From the 1990's on, globalization induced another structural change on the value system due to a growing number of merges and acquisitions and strategic alliances.

The second part of this research contributed to the knowledge on value systems of Porter (1991), business network theory of Amit & Zott (2001), Kamp (2005) and Hakansson & Ford (2002), the value networks of Stabell & Fjeldstad (1998) and the NVA of Peppard & Rylander (2006). The analysis on hypothesis 3 and 4 contributes to new insights in the existing scientific research. Hypothesis 3 stated that the expansion of service offerings causes new actors to enter the downstream activities of the automotive industry, see paragraph 6.3. As new services are beyond the traditional capabilities of the focal company, cooperation with strategic partners increases. In hypothesis 4, the statement was posed that service transitions influence the value network structure of the automotive industry, see paragraph 6.4. The analysis showed that the transition to services influences the inter-organizational relationships in the downstream activities. The market-based line of reasoning stated that in the service segments of an industry's value system, the competitive forces are much weaker. Due to the specific characteristics of services, customer needs and the large amount of intangible components this results in a value network. Therefore the downstream value system by Porter (1991) in this research was built around value networks rather than value chains. The value network structure showed strong similarities with the business network theory and applies to service industries. Both have a set of connected actors, in which each exchange relation is between business companies performing activities that interact with each other and have different roles. Therefore this theoretical framework, as discussed in this research, applies to the increasingly services oriented downstream activities of the automotive industry. Value will be added in the future through diversification into new services. The analysis showed that the downstream activities can be identified as a value network by using the general steps of the NVA. The value structure was analyzed based on a market-based view by mapping a Value Network of services of the focal companies. This provided a clear overview of the services of the focal company and the strategic partners associated with delivering these services, see Figure 14 to 17. The operationalization and application of the NVA to the automotive industry added to the research on modelling and analyzing value networks.

7.2 Practical Relevance

The economic trend of differentiation into services is found to be highly relevant and is considered central to the structural changes in the downstream activities of the automotive industry. The growing needs of customers related to mobility bring challenges as well as opportunities for OEMs and fleet management companies. Following the data analysis, the changes in the value creation structure today are based on transitions in the core business, technological developments and a changing customer behavior (from car ownership to car usage). This is strongly related to the fact that in the Past customers purchased a car, at Present they lease a car and in the Future, they will need flexible access to mobility. These transitions are mainly driven by a trend of urbanization and changing customer needs of the next generation (generation Y). These transitions have a significant impact on the future landscape of the automotive industry. New services in the area of (E-)mobility, consultancy and connectivity can foster new growth potentials in the saturated West-European automotive market, therefore services are increasingly important for the automotive industry. The analysis indicated that both the OEM and the FMCs are highly focusing on these services. This is relevant for the automotive industry since new services can create customer loyalty and barriers to change. Furthermore, the relation between the producer and the user does not end after purchase but continues through the life cycle due to the introduction of services. For customers new services like carsharing can provide access to

mobility in a relatively inexpensive and more flexible way by reducing the TCO. Customers are increasingly requiring access to multi-mode transportation (bus, train, car, bike and plane) while only paying a single flat rate for the whole package. Such mobility concepts will increase the need to align the downstream activities of the automotive industry, fostering cooperation among the actors. Therefore, the services are an element of the new holistic mobility approach. The data analysis also showed the type of services the companies are not active in, indicating a possible extension of the services. For the companies investigated this is especially true for ridesharing services. Furthermore, the analysis indicated a relationship between new services and actors. Due to transitions related to the core business, mobility providing and technological developments, new actors and new services become part of the automotive industry. This results in increased cooperation with strategic partners. Due to integration of mobility and technologies, the value system of the downstream activities of the automotive industry is expanding. Therefore the Integration of mobility is a key transition, fostering cross interoperability and cooperation. The industry is becoming increasingly networked. This is due to the fact that former competitors need to cooperate to offer integrated services. BMW and the fleet management companies for example are focusing on the growing European carsharing market, where convergence is expected.

7.3 Limitations

Limitations of the research are related to the case studies analyzed and to the research methods employed. In the case studies not all actors involved in the automotive industry were described, therefore a high level of aggregation was used. Since a map is static (snap shot), the analysis is limited in incorporating the dynamic aspects of the industry. Since most interviews are conducted on an individual basis, outside a protected company setting, it is possible that not all details were shared with the researcher. Furthermore, due to confidentiality issues, access to certain written corporate documents was limited. This was partly overcome by signing a confidentiality agreement upon request. Furthermore the research shows the intensive focus on services at BMW, but this is just one OEM. To get full insights in the transitions of OEMs in the automotive industry more research is required at several OEMs, this would enhance external validity. Due to time constraints and the difficulty to get into contact with these large OEMs, for this research it was found not to be feasible to extent the number of OEMs. But on the other hand, external validity is supported by the high rank of the interviewees within the company. This indicates a strong strategic focus, especially for the BMW case. Therefore this study provides a strong basis for future research. Also the geographic division of the interviewees strengths the external validity. The research project shows the practical difficulties associated with a NVA. Especially the value defined by the network and the network influences are found hard to operationalize in a qualitative research setting. In future research, the dynamics in the value network could be mapped using the value network, showing multiple value networks of a focal company at different stages. Furthermore, where this study provides a network-level dynamic perspective on value networks, the relations between the focal company and the actors in the value network could be investigated more in detail. Due to increased cooperation the network-level is increasingly a level of investigation which has the potential to provide meaningful insights in industry transitions. Future research could focus on the transition to services at other industries, by investigating the parallels between two industries the impact and causes of this type of transition could be understand better.

7.4 Recommendations

Practical recommendations focus on the West-European market only and are twofold for the FMCs and OEMs. The saturated West-European automotive market is facing a transition to answer the changing customer needs of Generation Y and the global trend of urbanization. Furthermore technological developments in the area of V2X communication and connectivity is about to change the way we think about moving from A to B (Briggs, 2013). Multiple new products and services related to E-mobility will be introduced in 2014 (SMM, 2013). This is changing the dynamics of the automotive industry to a large extend. Its outcomes will shape how actors in the automotive industry position themselves to create and secure revenues in the future. Actors in the downstream activities of the automotive industry are looking to diversify their revenue streams. The West-European automotive market has a large potential for carsharing services. Since the market is saturated differentiation into services is found to be a key source of value creation. Fleet management companies have their core business in Products as a Service (PaaS), they should be able to expand their range of services quickly and become providers of Mobility as a Service (MaaS). FMCs should expand their differentiation into B2B carsharing and mobility consulting services. Ridesharing is now seen as a potentially important part of the integrated mobility solutions (SMM, 2013). The changing mobility landscape, the opportunity to effectively integrate ridesharing alongside other mobility offers leads to sharing services becoming an important element of an intelligently networked mobility. Therefore the FMCs increasingly move away from their traditional business model of B2B car financing, as identified in the EP/PSS matrices. OEMs originate from a contrasting context, where R&D, production, assembly and sale of products are the core business of the company. Interesting to see is that OEMs can realize advantages over pure service providers when they diversify into Extended Products. The OEM is recommended to use its strategic advantage of producing products by increasingly combing these with services to increase value creation. This is essential to fulfill the customer needs in the future. Furthermore the expanding attention to services ensures customer contact and increases the revenues obtained during the use phase of their product. In practice this causes a transition in the core business of the OEM towards a provider of individual mobility. This is possible through their financial services divisions and by establishing strategic partnerships with established service providers. Since services are customer specific and feature more intangible components than physical products, services create information asymmetry. This enhances customer loyalty, increases switching costs and barriers to change a service provider. Therefore service differentiation can foster new growth potential for product bound industries like the mature automotive industry.

7.5 Conclusion

This final paragraph states the main findings of the sub questions followed by the answer to the main research question. To answer RQ 1 services were defined in the EP/PSS matrix, indicating the type of service (PSS) and the layer of the Extended Product (EP). The value creation structure was analyzed following the value system typology. This expanded by a network approach based on business network theory, value networks and the NVA, this answered RQ 2. To answer RQ 3, the trends that caused structural changes in the past were indicated. These transitions were mainly caused by technological developments, governmental regulation, suburbanization, an economic crisis or growth, changing customer demands and globalization. The final research question, RQ 4, was answered by indicating the transitions in mobility in the future. This indicated that actors will add value by diversification into services. Especially mobility services were found to be a key source of value creation in the future downstream activities of the automotive industry. The findings of these research questions serve to answer the main research question.

> *Main Research Question: How is the value creation structure of the downstream activities in the automotive industry influenced by the transition to services?*

The research indicated that value will increasingly be added in the future by actors in the downstream activities of the automotive industry through diversification into new services. The transition to services is not new to the automotive industry, in fact it is a key part of the automotive value system for almost a century. But the range of services has extended considerably in recent years due to transitions in the West-European market. The OEM increasingly sees the need of services in relation to its products, especially for (E-)mobility services are key. But also due to customer demand in the area of connectivity, services are progressively important. Therefore PaaS and MaaS are increasingly key sources of value creation in the transition to services for the OEM. Services are central to FMCs with their Product as a Service (PaaS) offerings in fleet management. For these companies a differentiation into services is identified as well. This is evidently defined in the expansion to mobility services (MaaS, e.g. carsharing) and consultancy services. This requires increased cooperation with strategic partners. Therefore this results in a value structure that becomes more networked, resulting in an extended networked value system in the downstream activities of the automotive industry.

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Appendix A Upstream activities

The upstream activities of the automotive industry are organized hierarchically in a value chain, consisting of three levels of suppliers: TIER-1, TIER-2 and TIER-3 suppliers. In 2005 OEMs were estimated to build their cars for 35% themselves, by 2015 it is estimated to be only 23%, the remaining part is fulfilled by suppliers (Gottschalk, Kalmbach, & Dannenberg, 2005)(Becker, 2006).

TIER-1

The capital intensive building of production capacities and international logistics management is essential for TIER-1 suppliers due to the globalization of OEMs. The TIER-1 supplier is a system integrator in the supply chain. The TIER-1 suppliers have competences in production-related integration and high-tech. Predominantly the TIER-1 takes on pre-assembly tasks as well as significant parts of the development of pre-finished modules, guaranteeing the whole supplier system. Today the TIER-1 has moved to its role as a system integrator by fulfilling tasks which were core business of OEMs for many decades. Another type of TIER-1 supplier is the module supplier which is generally less active in development and focused more on assembly, carrying a lower development risk but large responsibility for the entire logistics of the modules. For this type of suppliers a high level of competences in production is needed. The module supplier joins the parts and components from sub-suppliers together to a module (Becker, 2006). Furthermore some TIER-1 suppliers have evolved in so called global mega-suppliers, or TIER-0.5 suppliers. These companies supply major systems to the OEM. A global coverage is needed, close to their customers around the world as well as innovation and design capabilities.

TIER-2

Further up in the value chain is the TIER-2 supplier. The TIER-2 supplier is the system specialist, these type of suppliers command high technological development competence and low installation activity. Diverse assembly groups, aggregates and components are put together as a functional compound, but not necessarily as an installation unit (Becker, 2006). The special mark of the system specialist is its ability to come up with creative technological solutions which in niche segments give it a monopoly. These product innovations are initiated independently by the system specialist, not by order of the OEMs. The building and expansion of its own development potential required a readiness and ability to invest larger sums (Becker, 2006).

TIER-3

The TIER-3 parts and component supplier is characterized by relatively small installation activity and low development activity. It produces standard parts developed by the purchaser, according to exact specifications, and which can generally be produced without a high level of technology (Becker, 2006). Due to the hierarchical structure of the supply chain, the parts and components suppliers' purchases is increasingly seldom the OEM itself, the TIER-3 supplier acts as a sub-supplier for a TIER-2 supplier. The individual products are taken by a TIER-1 module supplier or system specialist and put to their intended use within a module or system (Becker, 2006).

Appendix B Product-Service System

Type of PSS		Description	Automotive example
Product oriented	Product related services	Provider sells product as well as services needed during use phase. Established OEMs (like BMW, Toyota and GM with its OnStar telematics operation) provide users with remote diagnostics services. Maintenance and repair services are commonly offered as part of an initial warranty period when purchasing a new car. OEMs offer Financing schemes with zero interest finance to consumers as an incentive to purchase a new car, in response to problems associated with saturated markets (Western Europe)	Maintenance contracts, warranties, car finance schemes, provision of spare parts (information brokering service for used car components), ELV take-back initiatives in relating to extended producer responsibility (EPR) in the EU
	Advice & consultancy	Provider gives advice on most efficient use of product. On Call Centre for driver assistance	fuel/energy efficiency info, driver training
Use oriented	Product lease	Cars are already the most commonly rented complex goods and leasing has become the most important means of financing purchases. Provider retains ownerships of product and is often responsible for maintenance/repair. User pays regular fee for unlimited individual access.	car leasing schemes, services by OEM captives, leasing of special cars as EVs. Athlon car lease, Alphabet, LeasePlan
	Product sharing (or renting)	Cars are used sequentially. Provider retains ownership of product and is often responsible for maintenance/repair. User pays regular fee but does not have unlimited access, same product used sequentially by users. There can be identified four main categories: public-private partnerships, co-operative, not-for-profit and commercial. This PSS is largely enabled by ICT innovations as NFC, apps and mobile payment.	Carsharing schemes: Swiss Mobility, ICS Italy, European carsharing organization (ECS), Greenwheels, SnappCar, AlphaCity, Zipcar (Avis), Car2Go (Daimler MS and Europcar), Ford2go, DriveNow (BMW and Sixt), Hertz on Demand
	Product pooling	Provider retains ownership of product and is often responsible for maintenance/repair. User pays regular fee but does not have unlimited and individual access same product is used simultaneously by users. Two broad categories are public schemes and restricted membership schemes	Carpooling and ridesharing schemes: meerijden.nu, Uber, carpooling.com (2001). blablacar, toogethr, roadsharing, wheelsforall, Wundercar
Result oriented	Activity management/ outsourcing	An activity of a company is outsourced to a third party. The way in which the activity is performed does not shift dramatically.	Outsourcing of mobility, done by fleet management companies
	Pay per service unit	In this PSS the Product still forms the basis of PSS, but here the user buys output of product according to level of use (number of km or time used). An all-in package enabled by ICT innovations, e.g. smart cards, NFC, apps. (PAYD, MaaS)	Cars rented/leased on a pay per km basis: Autoplus, Travel card,
	Functional result	Provider and user agree on an end result without specifying how the result is delivered, using a mobility mix. The three core elements are innovations, service and information.	Integrated mobility scheme: DB rent Germany. Public transportation (bike, train, taxi) by the NS in the Netherlands, Mobility Mixx

Appendix C Resource-Based view

Wernerfelt (1984) uses a broad definition of a resource by stating "*by a resource is meant anything which could be thought of as a strength or weakness of a given firm, defined by (tangible and intangible) assets which are tied semi-permanently to the firm*" (Wernerfelt, 1984). The Resource-Based view was initiated by Penrose in 1959 identifying the company as "*a collection of productive resources*" (Penrose, 1959). The RBV suggests that the capabilities and resources of a company are linked to long-term competitive advantage. Shankar and Bayus propose that "*a firm's customer network is an important strategic asset that can be used to gain a competitive advantage. A customer network helps a firm gain an advantage by creating an isolating mechanism*" (Shankar & Bayus, 2003). The RBV literature focuses on value appropriation and sustainability of competitive advantage, the dynamic capabilities approach is based on this theory which explores how valuable resource positions are built and acquired over time (Teece, Pisano, & Shuen, 1997).

Value creation in companies and networks of companies is frequently studied by analyzing resources (Montalvo & van de Kar, 2004). Until the 1980s, strategic research assumed that companies have an identical set of resources (de Reuver, 2009). The resource perspective was developed out of criticism on the popular five forces model for competitive analysis by Porter (Wernerfelt, 1984). Barney suggested a more realistic alternative, suggestion a heterogeneous spread of resources and relative immobility (Barney, 1991). The resource-based view (RBV) theory of the company builds on Schumpeter's perspective on value creation and views the company as a bundle of resources and capabilities (Amit & Zott, 2001). RBV theory presumes that the services rendered by the company's unique bundle of resources and capabilities may lead to value creation (Barney, 1991). This approach focusses on the internal resources of a company for value creation. The RBV argues that resources needed for service innovation are spread over multiple companies (de Reuver, 2009). Therefore, a set of companies should be analyzed rather than the single company to gain insights in the value creation. When applying the line of reasoning of the RBV to services transition it is argued by Kessler and Stephan that in contrast to the production of physical goods, which is based primarily on standardized and marketable resources, services rely on individual resources and competences (Kessler & Stephan, 2010). Services are customer centric and tailored to customer' needs, therefore deployment of services require specialized technological resources (IT) highly qualified labor sources and organizational knowledge. A bundle of these sources is difficult to imitate, hence a potential source of sustainable competitive advantage for a company according to the RBV. Furthermore services help to build company specific competences in developing and delivering customer value. Therefore service diversification of manufacturers constitutes a special form of related product diversification. Resources, which are characterized by imperfect tradability, imperfect substitutability, and imperfect imitability, are either strategic assets or knowledge-based (action-based) resources, such as skills and capabilities (Kessler & Stephan, 2010). Consequently manufacturing companies should exploit their strategic assets that are unavailable to other (service providers) competitors in the downstream activities. These strategic assets will typically be hardware-bound resources, such as outstanding technological know-how of the engineers and product developers, a good (brand) reputation with innovative and high-quality products, a large installed base in the market or a widespread and trained sales force that is familiar with the products of the company and has the specific know-how about customer needs (Kessler & Stephan, 2010). But since competitors with comparable resources will be able imitate the strategic service offering quickly, it is difficult to gain a sustainable competitive advantage.

Appendix D Business Ecosystems

The business ecosystem perspective is related to organizational theory, systems theory and complexity science concepts as self-organization, emergence, co-evolution and adaptation (Peltoniemi & Vuori, 2004) (Adner & Kapoor, 2010). It is based on organizational ecology literature, which investigates the health of communities of interrelated companies that collectively form ecosystems and company survival (Pierce, 2009) (Hannan & Freeman, 1977). The business ecosystems concept is merely used by key players in the high-tech (ICT) industries to define the loose network of distributers, suppliers, technology providers, competitors and outsourcing companies that are affected by companies product or service offerings (Gueguen & Isckia, 2011). Companies are embedded in a business ecosystem of interdependent activities, the ecosystem based view provides a framework and an alternative perspective to understand new forms of dynamic business networks (Kapoor & Mahn Lee, 2013)(Gueguen & Isckia, 2011). The business ecosystem differs from value network concept in the sense that in a business ecosystem actors share value without pursuing a common goal (Peltoniemi & Vuori, 2004). The concept of comparing a business environment to a biological ecosystem has been introduced by Moore who suggests that the term 'industry' should be replaced by 'business ecosystem', since economic activities can nowadays not be divided under specific industries and customers are offered a 'total solution' (Peltoniemi & Vuori, 2004). A business ecosystem is defined as "*a network of suppliers and customers around a core technology*" or "*an economic community supported by a foundation of interacting organizations and individuals, the organisms of the business world*" (den Hartigh & van Asseldonk, 2004) (Peltoniemi & Vuori, 2004). The business ecosystem consists of layers, corresponding to different levels of commitment to the business: the core business layer, the extended enterprise and the business ecosystem layer. The following actors in the business ecosystem can be identified: the Keystones (the leadership companies, the focal companies, who explore new business opportunities and enable renewal of the business ecosystem by system governance), the Dominators and hub landlords (companies who exploit the business opportunities by partner coordination and management) and Niche players (companies who develop capabilities to differentiate themselves by maintaining niche markets they contribute to the diversity) (Iansiti & Levien, 2004) (Peltoniemi & Vuori, 2004) (Jing & Ziong-Jian, 2011). The roles in an ecosystem can be multiple and dynamic, a company can play different roles in different ecosystems (Jing & Ziong-Jian, 2011). In a business ecosystem actors influence and need each other by innovation competition and collaboration, and every movement has its influence on the ecosystem. The relationships in the ecosystem are characterized by emergence, co-evolution, fragmentation, adaptation and self-organization, without formal external or internal leadership and the interactions between the actors produce results (Iansiti & Levien, 2004). The ecosystem is far wider than the direct actors, tangible and intangible relationships exist, making the ecosystem very dynamic and complex (Wiesner, Peruzzini, Doumeingts, & Thoben, 2013). In a business ecosystem alliances are developed over time in an evolutionary and co-evolving way. This organizational form enables distributed innovation by attracting all types of creative companies (Baldwin, 2012). Also, when an organizational design is focused on the individual company, it is inherent that the discussion is biased to competition, rather than coopetition. In a business ecosystem companies still have to compete on their value and attractive product or service offerings, but there is a better balance between cooperation and competition (Nielsen, 1988). According to Baldwin the larger system evolves, opening up new opportunities for recombination and new entrants (Baldwin, 2012). Furthermore the business ecosystem can enable activities, assets and capabilities to be more dynamic and responsive to a changing environment. Therefore

it can be valuable in adhering customer demand by delivering more complex solutions while maintaining corporate focus (Williamson & De Meyer, 2012).

The business ecosystem concept is said to be able to overcome the limits of other frameworks as strategic alliances and virtual organizations (Moore, 1998) (Anggraeni, den Hartigh, & Zegveld, 2007). Business networks and business ecosystems do not differ in the object they investigate but the perspective that is used to analyze the interconnected companies (Anggraeni, den Hartigh, & Zegveld, 2007). The business ecosystem concept should be used as a holistic perspective to look and understand a business network while incorporating the roles and strategies of the individual actors involved (Anggraeni, den Hartigh, & Zegveld, 2007). Because it emphasizes that the network can be a source of company renewal rather than an external threat. It defines the roles that can be played by companies and the strategies they can follow to maintain the health of the company and the ecosystem (Anggraeni, den Hartigh, & Zegveld, 2007). Business ecosystems include customers, lead producers, competitors and other stakeholders such as governmental bodies, associations and standardization bodies. Therefore the latter includes a wider variety of actors compared to the business network (Peltoniemi & Vuori, 2004) (Heikkilä & Kuivaniemi, 2012).

Appendix E Interview Protocol

This protocol is used as a guide by the researcher when conducting interviews. The protocol provides continuity of questions asked across several interviews. The proposed interview scheme is used to define the data collection procedure of this thesis research project. Data collection is focused on the concepts value, industry structure and services in the automotive industry. Due to the semi-structured nature of the interview, the questions are meant as a guidance and are not supposed to be articulated to their full extend.

Prior to the interview the interviewee should be identified by searching for essential background information. An email is sent with a short explanation of the research project and the contact details of the interviewer. The time and date of interview are arranged and interview questions could be send in front when interviewee upon request. The questions are not strictly divided into current and future situation. By combining the present situation (P) and/or future vision (F) in one question the interviewee is found to be better capable to define the transition. In that way the interviewee can elaborate on the present situation and extrapolate it to the future. It is the task of the researcher to unravel it into two separate situations.

BACKGROUND INFORMATION INTERVIEWEE	
Interviewee	
Company	
Function	
Date and time	
Location	

INTERVIEW INTRODUCTION	
Introduction	About myself and my Master thesis project
	Objective: I want to find out how the value creation distribution is changing and were value is created in the automotive industry
	Methodology: case study & market study based on expert panel
Confidentiality	The researcher writes contextual interview notes
	Only the researcher will access the recordings and notes
	The researcher will consult you about using the names in the report
	Recordings and notes will not be archived after this project
	Letter of confidentiality can be signed upon request
This interview	I would like to take some notes
	Ask permission for recording
	This interview will take approximately 50 minutes.
	The interview contains questions about the Current situation (P) and Future transition (F) and is divided into four parts, questions related to the context, services, value creation and to industry organization.
Context	Focus on focal company, its services, value creation and industry structure What type of company is it and what is your position within the company?

INTERVIEW QUESTIONS	
Questions related to services	
1	What services is the company offering (and why)? (P)
2	What new services is the company planning to implement? (F)
3	Why is the company moving to these new services? (F)
4	Who are the main competitors and is this expected to change in the future? (P&F)
5	With what key partners is the company cooperating to offer these services? (P&F)
Questions related to value creation	
6	What is the role of the key partners in the network? (P)
7	How is value currently created now and in the future? (P&F)
8	What is exchanged in the network and how will this change? (P&F)
Questions related to the industry organization of the value network	
9	How would you describe the influences (direct or indirect) per network actor? (P) (exchange of services, affection and liking, information or influence)
10	How would you map the relationships of the company? (P)
11	What are key trends and how is the company going to cope with these trends? (F)
12	How is the company position going to change in the future (map the relationships)? (F)

CONCLUDING REMARKS	
End	What is the position of the company within the automotive industry, and how will this change?
	Did I miss something important, could you elaborate on that?
	What did you think of the interview?
	Who do you think I should talk to in relation to this research subject?
	Thank you for this interview

Appendix F Interviewees

The table below shows the list of interviewees, their occupation, company they work for and the country. Underneath the primary doc families are listed. The primary doc families were used to cluster the interview transcriptions (in the *Primary Doc Family Manager*) in ATLAS TI.

Filters per interviewee

Interview	Occupation	Alphabet	Athlon Car Lease	LeasePlan	BMW	Belgium	Germany	The Netherlands
1	Vice President		■					■
2	President				■			■
3	Int. Project leader	■					■	
4	Senior Manager			■				■
5	Strategy E-mobility				■		■	
6	Co-founder							■
7	Mobility Consultant			■		■		
8	Mobility Consultant		■					■
9	Product Manager	■				■		
10	Sr. Business Developer			■				■
11	Business Developer			■				■
12	Product Manager	■				■		

Primary Doc Families (8)

Primary Doc Family		Primary Documents		Codes	Quotations
A	Alphabet	3	(3,9,12)	74	73
B	Athlon Car Lease	2	(1,8)	64	70
C	LeasePlan	4	(4,7,10,11)	72	84
D	BMW	2	(2,5)	62	80
E	Belgium	3	(7,9,12)	73	68
F	Germany	2	(3,5)	74	69
G	The Netherlands	7	(1,2,4,6,8,10,11)	105	192
H	Fleet Management Companies	9	(1,3,4,7,8,9,10,11,12)	109	227

Appendix G New Services at BMW

The field of location-based mobility services (LBS) is emerging and continuously changing. In order to engage in a flexible way, the BMW Group has founded BMW i Ventures. The venture capital company aims to promote mobile apps and mobile technology as part of its long term growth strategy in new mobility products and services screening over 600 new start-up investment opportunities to provide a combination of car enabled, dependent or independent mobility services in order to become a leading provider of premium mobility services. The newly developed BMW i Mobility and ConnectedDrive services are an important part of this concept. They link these components together seamlessly, permitting an intelligent, comprehensive and sustainable mobility experience (BMW, 2013). Furthermore the OEM offers with BMW i 360˚ Electric mobility services as add-on mobility, BMW i ConnectedDrive, maintenance and repair and mobility assistance. BMW Service Inclusive in the integrated service package offer to new car buyers, covering maintenance for a couple of years for a subscription fee. Listed below are most of the BMW i mobility services and ConnectedDrive service.

BMW i Mobility Services

BMW *i* Mobility Services		
DriveNow	2011	Joint venture with Sixt and Mini, a carsharing service. Allows customers to locate and reserve the nearest car using the DriveNow app and unlock the car using a digital key incorporated in the driver's license.
ParkNow	2012	park@myhouse, parkopedia. Allows customers to search and pay for parking spaces using their Smartphones. Currently available in San Francisco, will be expanded to other cities.
ChargeNow	2013	BMW i Venture investment in Coulomb Technologies, the mother company of ChargePoint. For public and semi-public EV charging points. In the Netherlands in cooperation with the ANWB
MyCityWay	2011	BMW i Venture investment: My City Way provides users with information on public transportation, parking availability, and local entertainment for cities
Park@MyHouse	2006	BMW i Venture invested in 2011
Chargepoint	2012	BMW i Venture investment, network of 15.000 EV charging stations
Embark	2012	BMW i Venture investment 2012. Makes mobile apps for mass transit riders
Life360	2013	BMW i Venture investment. With over 30 million users, Life360 is the leading location and communication app for families
Alternate Mobility Program	2014	Add on mobility: customized mobility solutions for longer excursions, in combination with the BMW i3

BMW ConnectedDrive services

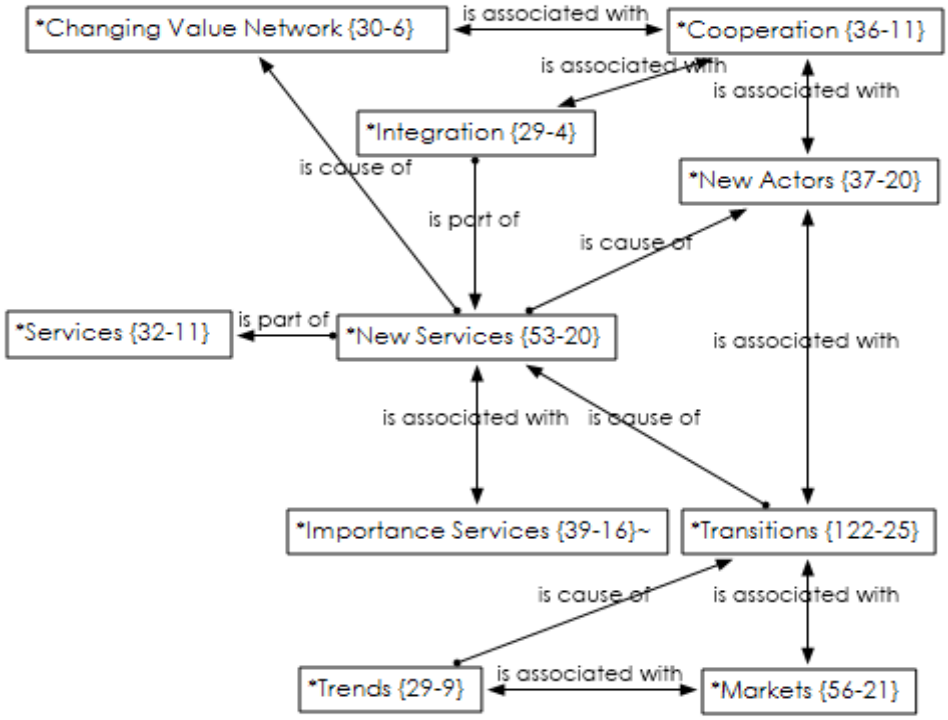
BMW ConnectedDrive	
BMW Assist	Ecall, enhanced automatic collision notification (emergency call) (introduced in 1997), in cooperation with Vodafone (since 1999) part of telematics services
BMW Teleservice	Condition Based Service , Intelligent maintenance system
BMW Tracking	Stolen vehicle tracking
BMW Online	BMW LTE, BMW Car Hotpot
BMW Apps	e.g. Pandora, Mog, Sticher, Aupeo, Baidu Music, Deezer (subscription music service), Napster by Rhapsody (subscription music service), TuneIn (Internet radio), Audible (downloadable audio books and other spoken-word content), Glympse (temporary location sharing in real-time), Snippy, Kicker, Qype, Number Plate Research, Deutsche Post and Weather apps
BMW i ConnectedDrive	BMW i eNavigation (Real Time Traffic Information) and BMW i Remote App (Car monitoring, mobility planning and efficiency optimization, BMW roadside assistance)

Appendix H Inter-Coder Reliability

Code list secondary coder for four transcripts

Code	Quotations in original transcript (#)	Quotations in second coder transcript (#)	Match (#)	Match (%)	Quotations final transcript (#)
Cooperation: increasing	3	0	0	0%	3
Cooperation: OEM	0	0	0	100%	0
Cooperation: Leasing companies	2	2	2	100%	2
Cooperation: Public transport Operators	2	1	1	50%	2
Cooperation: Others	6	4	3	50%	7
Core Business: Services	5	4	4	80%	5
Customer Needs	3	2	2	67%	3
Extended Products	1	0	0	0%	1
Importance Services: Car Sharing	2	2	2	100%	2
Importance Services: Customer Relation	6	4	4	67%	4
Importance Services: Financial Services	3	3	3	100%	3
Importance Services: Mobility	0	0	0	100%	0
Importance Services: Others	5	2	2	40%	7
Integration: Mobility	7	6	5	71%	8
Integration: Services	10	8	8	80%	10
Markets	40	45	40	100%	42
Markets: Maturity High	7	2	2	29%	7
Markets: Maturity Low	1	0	0	0%	1
Markets: Mobility Services high	2	2	2	100%	2
Markets: Mobility Services low	0	0	0	100%	0
New Actors: Competitors	4	4	4	100%	4
New Actors: Financial Services	2	0	0	0%	2
New Actors: OEM	5	4	4	80%	5
New Actors: Platform Providers	1	0	0	0%	1
New Actors: Strategic Partners	8	4	4	50%	6
New Actors: Others	7	10	7	100%	9
New Services: Car Sharing	9	7	7	78%	9
New Services: Increase	1	0	1	100%	1
New Services: Mobility	3	2	1	33%	3
New Services: Others	10	3	3	30%	10
Services: Car Sharing	0	0	0	100%	0
Services: Consultancy	2	2	2	100%	2
Services: Leasing	3	3	3	100%	3
Services: Maintenance & Repair	3	3	3	100%	3
Services: Others	6	7	6	100%	7
Transitions: Differentiations	10	5	5	50%	7
Transitions: Extended Products	2	1	1	50%	2
Transitions: Mobility Provider	4	3	3	75%	4
Transitions: Ownership-Usage	7	7	6	86%	7
Transitions: Technological Developments	12	5	4	33%	7
Transitions: Others	15	30	14	93%	26
Trends: Generation Y	3	3	3	100%	3
Trends: Urbanisation	6	3	3	50%	6
Trends: Others	2	0	0	0%	4
Value Network	20	4	4	20%	23
Total	250	197	168	66%	263

Appendix I Atlas TI coding



Network View Super codes

Co-occurrence Super codes

	*Changing Value Network	*Cooperation	*Importance Services	*Integration	*Markets	*New Actors	*New Services	*Services	*Transitions	*Trends	TOTALS:
*Changing Value Network		8	3	5	1	7	4	1	11	2	42
*Cooperation	8		5	3	3	8	9	0	12	0	48
*Importance Services	3	5		1	2	2	7	2	15	2	39
*Integration	5	3	1		4	6	11	5	7	1	43
*Markets	1	3	2	4		5	6	18	12	4	55
*New Actors	7	8	2	6	5		12	0	13	0	53
*New Services	4	9	7	11	6	12		1	15	1	66
*Services	1	0	2	5	18	0	1		8	0	35
*Transitions	11	12	15	7	12	13	15	8		17	110
*Trends	2	0	2	1	4	0	1	0	17		27