Professional MBA
Automotive Industry

Analysis of open source business model and its consequences on the value chain of automotive industry based on Continentals AutoLinQ platform

A Master's Thesis submitted for the degree of
"Master of Business Administration"

supervised by

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"Now, go use these theories!"
(Christensen et al. 2004: page 273)

Affidavit

I, **CHRISTOF, DIPL.-ING. BAIER**, hereby declare

1. that I am the sole author of the present Master's Thesis, "ANALYSIS OF OPEN SOURCE BUSINESS MODEL AND ITS CONSEQUENCES ON THE VALUE CHAIN OF AUTOMOTIVE INDUTRY BASED ON CONTINENTALS AUTOLINQ PLATFORM", 111 pages, bound, and that I have not used any source or tool other than those referenced or any other illicit aid or tool, and
2. that I have not prior to this date submitted this Master's Thesis as an examination paper in any form in Austria or abroad.

Vienna, 15.12.2010

Signature

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List of abbreviations

3G/4G	Third and Fourth Generation of cellular wireless standard
ASL	Apache Software License
API	Application Programming Interface
ASR	Automatic Speech Recognition
B2B	Business to business
B2C	Business to consumer
B2G	Business to government
BRIC	Brazil, Russia, India, China
BSD	Berkeley Software Distribution
C2G	Consumer to government
C2C	Consumer to consumer
C2B	Consumer to business
CAN	Controller Area Network
CD	Compact Disc
COTS	Commercial off-the-shelf (software)
CRM	Customer relationship management
CVIS	Cooperative Vehicle Infrastructure Systems
DPL	Defensive Patent Licensing
e-commerce	electronic commerce
EBIT	Earnings before interest and tax
ECU	electronic control unit
EDGE	Enhanced Data rates for GSM Evolution
EUR	Euro
FLOSS	Free/Libre Open Source Software
GPL	General Public License
GPLv2	General Public License version 2
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Groupe Spécial Mobile (Global System for Mobile Communications)
HR	Human Resources
HMI	Human Machine Interface
HSDPA	High Speed Downlink Packet Access
HUD	Head up Display
ICT	Information and communication technology
IMP	Industrial marketing and purchasing
IPR	Intellectual property rights
IT	Information technology
ITU	International Telecommunication Union
KAM	Key Account Management
LBS	Location based services
LGPL	Lesser GPL
m-commerce	mobile e commerce
MIT	Massachusetts Institute of Technology
MOTS	Modified off-the-shelf
MPL	Mozilla Public License
NFC	Near Field Communication
OBD II	On Board Diagnostics
ODM	Original design manufacturer
OEM	Original equipment manufacturer
OS	Operating System
OSGI	Open Service Gateway Initiative

P2P	Peer to Peer
PC	Personal Computer
PDA	Personal Digital Assistant
PEST	Political Economic Social and Technological Analysis
PESTLE	Political Economic Social Technological Legal and Environmental Analysis
PND	Personal Navigation Device
POI	Point of interest
R&D	Research and development
RIM	Research in Motion
RPM	Revolutions per Minute
SBU	Strategic business unit
SCM	Supply chain management
SDK	Software Development Kit
SI	System integrator
SME	Small and medium-sized enterprises
SMS	Short Message Service
SW	Software
SWE	SW engineering
SWOT	Strengths Weaknesses Opportunities and Threats
TTS	Text to Speech
UI	User Interface
UMTS	Universal Mobile Telecommunications System
USD	US Dollar
USP	Unique selling proposition
V2I	Vehicle to Infrastructure
V2V	Vehicle to Vehicle
VCS	Value creation system
VDA	Verband der Automobilindustrie
VO	virtual organization
VSC	Value system continuum
WiMAX	Worldwide Interoperability for Microwave Access
WLAN	Wireless Local Area Network

Abstract

The internet usage in the car and the connectivity of the car to its environment is one of the emerging markets with a disproportionate growth potential within the automotive industry.
This thesis elaborates the AutoLinQ™ platform and business model on base of the preceding industry analysis. Starting with an analysis of the external development and Continental internal strategy the business environment of the platform is described. In the next step the methods used in this thesis are described, business cases and literature are selected to derive the appropriate use for the automotive industry. The prerequisites are listed and discussed to order the various methods, e.g. value net and five forces analysis. The business model analysis builds upon the industry forces. The two main aspects of the business model are further discussed, i.e. the selection of the open source licensing model and the applications using the AutoLinQ™ platform. The detailed concept is developed in the next step following the same structure. Based on the identified influencing factors of the two overlapping industries, i.e. automotive and telecommunication, the business model is further discussed and several concepts are described as input for the prototyping phase. The business model from Continental for the platform is described as well. The comparison of both approaches identifies the strengths of Continental's AutoLinQ™ business model. Additional ideas derived from the industry analysis and the different business models challenges the actual concept. Finally further improvements are discussed mainly in regard to the licensing model and the application selection for the ecosystem based on AutoLinQ™.

Executive summary

In the last few years the internet became the medium of information, communication and entertainment. Based on the emerging distribution of smart phones more and more people are able to be always and anywhere online, e.g. in the office, at home and lately the mobile web access in cars is available as well.
The main subject of this master thesis is to analyze the new emerging industry of mobile web access in the vehicle and to compare this to the business concept of Continental's AutoLinQ™ business model.
The main feature of AutoLinQ™ is to provide an internet connection within the car and to use similar applications in the infotainment system as the user knows from the PC and smart phone. The AutoLinQ™ concept provides four different usage scenarios. Logically the first one is the in car usage called "car view", e.g. connectivity, LBS, navigation and telematic services. In the second one "mobile view" the remote operation of the car is the important feature, retrieve the car status and location of the car. The "home view" is the third use case, e.g. vehicle status information and application download. The fourth view is the "partner view" for all members in the AutoLinQ™ ecosystem, i.e. providing an application store and the application certification for vehicle usage.

The industry analysis starts with the company external environment derived from the existing mega trends in the automotive industry and the telecommunication industry, e.g. globalization and shift of market focus, cost pressure for development activities, individualizing of customer needs and continuous innovation. The result will be an even more complex business environment with a larger degree of specialization for all companies. This requires that companies can provide the latest technology, e.g. safety equipment, entertainment systems and communications devices, enabling growth in automotive electronics and therefore new products and features will become one of the most influencing factors for business success in the industry.
The identified external developments within the automotive industry are mapped to Continental's Interior Division strategy in the next step.
Following the description of used methods, i.e. five forces and value net analysis, different concepts of business models are discussed. For a detailed discussion of the basic AutoLinQ™ concept the two main components are further detailed, i.e. open source licensing model and applications enabled by AutoLinQ™ platform.

In the next step the market definition is discussed, available reports and studies are taken into consideration for the pre selection of interesting market segment depending on used product platform, customer segmentation and geographical region. The potential quantities and revenues are the main criteria's for the ranking. The analysis starts with the value net analysis with the focus point end user. Starting with the customer need the value net is drawn and every step that generates additional value is listed and connected to the other nodes in the network. With the identification of the major area where the highest expected value is generated for the delivered product or service a first comparison to the existing position of Continental in the value creating network is given.
The selected node within the value net is the central area for the five forces analysis. The influencing factors are described now from the view of this node in the network according the Porter's five forces. The references are mainly taken from the smart phone industry including application market segments and the classical automotive industry structure from the view point of the tier one supplier. Within a changing or emerging industry some players can change their position to increase their value adding contribution. A company can actively focus on changing the industry with innovative products and solutions that offer a better value for the buyers.
The findings from this analysis, i.e. the impacts in regard to the tier one supplier position of Continental in this emerging market with many new competitors and cooperating companies entering, are used as input for the business model development. The business model is split into different detailed concepts following the innovation, infrastructure management and customer relationship management. Some typical concepts from the smart phone business industry are compared and the prototyping approach is started by describing a first differentiation using various patterns. The main focus is laid on the to customer segments, i.e. end user, engineering community and OEM customers, with the infrastructure or Innovation pattern for the two B2B concepts and free or fermium pattern for the targeted end user. The existing forms of platform integration in the smart phone business influences the selection of the appropriate operating system platform to a major extend and is discussed in respect how the selected business model is supported.

Related to this the selected IPR concept is very important because the licensing model is the major criteria for the engineering community and the ecosystem providing the framework of engineering and business activities. The open source

model elaborates different possible licenses, e.g. GPL, EUPL, and Apache License. The benefit for selecting different licenses is discussed and advantages are described.

Several lawsuits against Google for patent infringement highlight how Android is going to become a big target in court, e.g. Oracle, Gemalto, Apple. Some cases are brought to court against companies just for using Android e.g. HTC reached an agreement with Microsoft to prevent such a lawsuit.

This is a clear hint that the patent situation especially for Google's Android is not finally settled and a patent free provision of the SDK / API for AutoLinQTM application is necessary to give the engineering community the security not to be drawn into such kind of lawsuits. This circumstance is one of the most important issues to be solved for setting up a developer community and ecosystem. A quick patent search is performed and relevant patents are listed in the annex. The patents can be grouped into different categories, e.g. firstly a hardware box with a wireless communication interface and a connection to the vehicle communication bus, secondly a central internet server collecting the data and thirdly a simple gateway transferring the data from the vehicle to a wireless device. Nearly every patented solution collects data from the vehicle, i.e. low level frames with data packets or OBD II messages.

The second detailed elaboration covers the potential applications and white data services. Many applications just use the data provided via vehicle internal gateway on a smart phone, e.g. engine RPM, engine coolant temperature, air temperature, vehicle speed, trip time, tire pressure, number of occupants, parking distance, steering wheel angle and fuel level. The social network can be extended to include the vehicle and its position to enable the possibility to offer a drive from point A to point B. Another type of usage of the smart phone in the car is to make it part of the user interface of the infotainment system with its touchpad or the voice recognition feature can enable the seamless integration into the vehicle.

With these features user can provide data for the OEM, dealer, repair workshop or insurance company to receive a personalized offer well suited for individual needs, e.g. service alerts and pay per use services.

All the location based service will be extended into the car, e.g. extended data sharing apps like a speed camera warning along the route. The speed information can be displayed in an augmented driving app showing lane detection, distance measurement to the car in front and reading traffic signs.

One further step is the car steering just by using the smart phone, e.g. the driving direction is selected just by tilting the smart phone in the indented way.
The AutoLinQTM business case is described in the following section of the master thesis and finally compared.
The usage of several business models for prototyping different possible scenarios is recommended to increase the understanding of the emerging market.
A further investigation of patents is necessary to file own patents that can be brought in for the ecosystem. For the engineering community the development of applications for iOS or Windows Mobile 7 is not comparable to the AutoLinQ™ concept where a complete SDK and API with connected services are provided.

The split of the business case into different business models, i.e. for OEM, developer community and end customer, enables the focus on the different customer groups with a dedicated concept.
The revenue model for a tier one supplier has to be extended by application development, services provisioning, e.g. training, acceptance testing of apps and community support. The hardware used for the data transfer from the vehicle to the mobile device is more the classical business case for a tier one supplier and is the enabling base for entering the aftermarket as well.
Smart phones will become the main device for customers to manage their mobility needs using telematic services, infotainment and they require reliability, vehicle integration, i.e. embedded connectivity and bandwidth for data streaming.
The conclusions and recommendations for a fast start up of the engineering community Continental should sponsor a contest for the best automotive app using the SDK / API of Continental and Android.

The merge of life and social network activities inside and outside the vehicle will provide a complete new driving experience based on today’s smart phones and car electronic.

1. Introduction

In the near future the car will be always connected to the internet and will become one part in an intelligent environment using pervasive computing. Like the smart phone the car will become aware of its environment and will interact with several devices without human intervention. With this complete new usage pattern a new market will emerge and open up until yet unthought-of applications and new business models for all players in the automotive industry. Beside the well established companies in the automotive industry new players will enter this market, i.e. mobile phone manufacturer, mobile service provider and other companies in the e-commerce market. This developing market will attract many competitors and new alliances or cooperation's to gain a significant share of the market. In addition to its own size, the automotive industry generates more economic activities through various backward to the supplier industry and forward linkages to the customer, see (Heneric et al. 2005: page 5).

Two different industries grow closer together. On the one side the automotive industry with the main goal to provide mobility to the individual and the ICT industry with mobile communication providing location based services and connectivity on the other side. So far the two industries had only small touching points, i.e. hands free phone kits for the car or navigation systems are available since a few years with emerging new location based applications based on new smart phones will lead to many new usage scenarios of the two main products a car and smart phone and the related services provided. Both industries have different business models and the influence of each other will change the revenue streams significantly. In 2008 the VDA in Germany clearly stated the need for cooperation's over different industries.

> "*The connection within a car and to the external infrastructure is the key success factor for telematic and traffic management services, therefore the goal is to enable the cooperation of automotive industry, i.e. OEMs and tier n supplier, with road infrastructure provider, data service provider, e.g. navigation and traffic information, and device manufacturer.*" (VDA 2008: page 10)

This emerging market will create a new center of gravity and as in astronomy when two galaxies collide a complete new distribution of the major players will be the consequence. Who will build this new economy and who will just react on the changing environment? Who are the forerunners and who will lose momentum? Will the main OEMs in the car industry survive against the main players in the communication industry? Collaboration will benefit to all players in the market. In

addition to the small number of OEMs and several hundred tier n supplier will create services together with a handful of global telecom service providers. The local players will only in exceptional cases participate in this global market.
Product portfolio will range widely from build in infotainment modules to smart phones as well. This will lead to a fragmented device market targeting to solve the same customer needs.
How can a tier one supplier in the classical value chain in the automotive industry develop this new business and gain a significant position within the new eco system? The Interior division of Continental Automotive follows the vision "Always On". Drivers and passengers can access to information every time and stay connected through all car usage phases, e.g. driving, parking and at home.
This thesis should answer the question by comparing the theoretical business model concept with Continentals AutoLinQ™ business case.

1.1 Research question

What are the changes in the value chain of automotive industry due to the entrance of mobile services providers and the consequences for the existing major players focusing on tier one supplier? What will be the opportunity for Continental as a tier one supplier?
Supporting research questions:

- Who in the automotive industry value chain is in the best position to reach a dominant market position?
- What is the revenue type and potential for a tier one supplier?
- What are the key applications to develop the market?
- What is the right IPR concept, challenging the open source approach?

In detail the core elements of the business model will be discussed and the development of the model over time and implementation phases. How does the business concept of Continental follow the theoretical approach that is state of art derived from existing literature and available case studies?
The aim of thesis is do identify possible business models for tier one suppliers and a detailed evaluation of the business case for Continentals AutoLinQ™. What is the appropriate business strategy for tier one supplier in the new eco system including OEMs, engineering service provider, developer communities, platform provider and end user?

The thesis is mainly based on literature study, business cases and available industry data from various research and consulting firms. For the theoretical concept and industry analysis the methods of value net analysis and five forces are used including data from the Continental business case. Documentation of the used data or the planned data respectively is listed and how it will be collected. Take available data from the case AutoLinQ™ from Continental AG. Extract data from existing literature about m-commerce and mobile application market. Take data from the automotive installed base, i.e. vehicle usage. Combine both figures to estimate the market size for automotive based mobile services.
This thesis will not cover any technical or underlying communication technologies, because for the business case it is not relevant which wireless technology, i.e. 3G/4G or WiMAX/WLAN, GPRS/Edge or UMTS is used. In addition the important questions concerning privacy and data security issues are not covered. All potential innovations regarding car2car communication are not part of the thesis.

1.2 Research methodology

The major activity is based on an extensive literature review to identify the basic definitions of business model. The business case is analyzed based on available data. The environment with the industry and existing partnerships are collected from the relevant company information's. In addition the available literature and existing market studies are explored to identify the important influencing factors. The following qualitative analysis is based on the theoretical concepts and the description of the case study.
In the existing literature and scientific community many detailed studies are available and the most relevant and recent figures are used for the principal analysis. There are also empirical studies available and these results are used as well. For the market information some studies and industry reports from professional companies are referenced to underline the findings and conclusions. Basic literature is introduced in the next chapter were the methodical work is outlined. The critical scientific discussion of recommended methods is reflected in the next chapter and taken into consideration by selection of the procedures used for the analysis. Additional existing industry analyses are referenced where applicable to use their conclusions for the case discussion here.
In addition company sources are collected to identify existing cooperation’s including annual reports and press releases. Industry studies from trade associations,

government sources and professional consulting companies are included as well to further detail the available data and to support the scientific sources with latest market and industry figures.

1.3 Structure of thesis

The overview is shown in figure 1. Beginning with the introduction in chapter 1 and the presentation of the main research question.

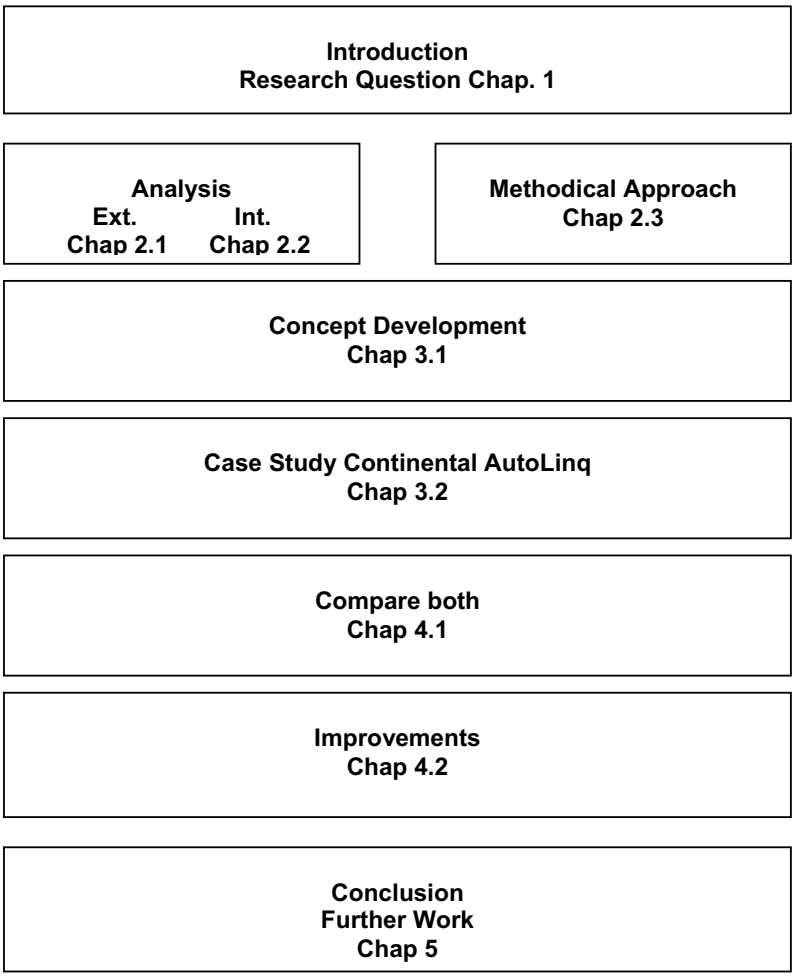

Figure 1. Overview Structure Master Thesis

In chapter 2 the basic analysis is performed. Firstly the external factors are evaluated and secondly the internal factors from Continental are presented.
In chapter 2.3 the actual literature is examined for the relevant theoretical concepts needed for the further analysis of the changing automotive industry. In addition

available business case studies are used to collect the actual development within the automotive and ICT industry.
Derived from that base the concept is developed in chapter 3. First the business model is further detailed from the theoretical concepts. Then the business model of Continentals AutoLinQ™ is described.
The comparison of both business models in chapter 4 presents the main results of the thesis. Based on the differences additional improvements are identified and the advanced items are described.
In chapter 5 the conclusions are collected and further research suggestions are listed.

2. Analysis

Firstly the definition of the basic concept of value creation systems is done and secondly the differences between business model, business case and business plan are explained. Several similar terms are used to describe concepts that are different in details and viewpoints. In the industry analysis terms like value chain, value system, value net, value web, value constellation or virtual organizations VO can be found in the literature and scientific articles meaning more or less the same. According to the definition given by Bernd Wirtz in (Wirtz 2010: page 97) the value creation system can be divided into value chain, value system and value constellation. The basic definition of a value chain is given by Porter in (Porter 1985: page 11) and refers to a linear flow of activities adding value to a product or service. In comparison the value system consists of two or more value chains existing parallel, i.e. an exchange or overlap is evident. One example given by Wirtz is the reuse of the MP3 player concept from Apple iPod for the iPhone product. (Wirtz 2010: page 87). Only a single company is involved in the analysis of a value chain or value system. If two or more companies create value together a value constellation is formed. The terms value net, value web or virtual organization are synonyms for a value constellation. The value net analysis was introduced by Parolini (Parolini 1999: page 68) and used for a detailed description of the value creation in the publishing industry and is derived from Porters value chain concept as well. The main focus is the value generation between independent firms within the network or ecosystem.

The definition of a virtual organization can be found in (Haas et al. 2007: page 84). In this analysis emerged VOs and initiated VOs are distinguished. The first have a leading company aiming to realize a concrete business case and the later are supported by external entities, e.g. governmental organizations or universities.

The value network includes all suppliers in the upstream and all downstream customers, e.g. distributor, retailer and consumer, and their partners. Existing value nets can overlap and develop into a cooption business model or a disruptive new value network depending on the degree of complementary of the two networks, see (Christensen et al. 2004: page 63). There are different forms of value creation constellations existing, for the software component business the four types, i.e. competitive, collaborative, customary and supplier dominance, are identified by Helander, see (Helander 2004: page202). In general the value network concept is homogenous for physical products and services. This is even more valid for service

networks that include products and associated services, see (Basole & Rousse 2008: page 55). The notion "business ecosystem" is used in a similar way especially in the ICT industry and according to (Gueguen & Isckia 2009: page 46) a loose connection of technology providers, suppliers, outsourcing companies, distributor and any other complementors to a company's own offer.

The business model is according to Wirtz (Wirtz 2010: page97) the company specific model of a value constellation and therefore derived and further detailed from the general industry analysis. Within the business model the value constellation is extended by the actual position of the company within the network, i.e. all relevant data and information is added to describe the contribution of the firm. The business model and the value net are dependent, i.e. a change in one of them leads to a consequent change in the other. One major goal of a business model is to define the value creation and its evolution over time for a specific company. Different definitions of a business model are available in the literature. A very good overview is given by Wirtz (Wirtz 2010: page 88). He further develops the definition of an integrated business model using nine different subsystem called "Partialmodelle" (Wirtz 2010: page 116) within three major components, i.e. strategy, customer and market and value creation. A more practical approach for the daily work in a company is provided by Osterwalder in (Osterwalder & Pigneur 2010: page16) in business model generation. It consists once again of nine building blocks and supports a quick way of defining the business model. Another concept for the business model can be found at the Boston Consulting Group with six major influencing parameters of a business model divided into two groups, see (Lindgardt et al. 2009: page 2). In the value proposition group are included target segment, product offering and revenue model and in the group operating model are listed value chain, cost model and organization.
A business model is not something static because change within a company and in its environment is evident and nearly constant and therefore the model is very dynamic and has to be updated regularly. Wirtz defines five phases of a business model, i.e. design, implementation, operation, change and controlling. (Wirtz 2010: page195) Similar five phases are used by Osterwalder in (Osterwalder & Pigneur 2010: page 248) with the main focus on the early phases of the business model definition, i.e. mobilize, understand, design, implement and manage. In contrast to that the Boston Consulting Group only has one permanent phase called business model innovation, see (Lindgardt et al. 2009: page 1).

Another term in this respect is the business plan. Following the definition from Wirtz (Wirtz 2010: page218) a business plan is a formal description of one dedicated business model, including detailed calculations to proof the profitability of one or more models. The business plan has a different target audience, i.e. external investors and internal stakeholders see (Osterwalder & Pigneur 2010: page 268). It can be used in the implementation phase as a guide line for the entrepreneur and management team.

2.1 External Analysis

In the business environment of a tier one supplier nearly an uncountable number of influencing factors exist. First of all there are general so called mega trends valid for every industry then specific global trends within the automotive industry change the rules for the players in the value system. Additional trends from other industries influence at least customer expectations and therefore change the rules for the automotive industry as well. In this chapter the most important external factors are described to take their influencing power into consideration for the analysis. Main resources available from the industry surveys of specialists, consulting firms and existing literature are taken into consideration. The literature and studies covering the future development of the global automotive industry is comprehensive and the most recent ones are listed in this chapter.

The global competition is further intensifying and has for European industry sectors different regional contestations, e.g. *"...the biggest challenge for EU policies is probably industry (especially manufacturing) with regard to China, business services with regard to India, agriculture (and biofuels) with regard to Brazil, and energy imports and transit (especially gas) in relations with Russia*." (European Commission 2009: page 62). Trends in customer behavior will shape the relationships and business models of the future. A growing middle class in the BRIC countries on the one hand is in contrast with the ageing population in Japan, Western Europe and the US on the other hand, i.e. still growing markets with different demands and priorities from the end user. Another global trend is the increasing urbanization and the problems related to that. Solutions must be provided by the automotive industry, e.g. noise reduction, zero emission to reduce pollution and reduced commuting time despite crowded streets in the mega cities, see (Deloitte 2009: page 9) In this respect of reduction of emission and together with increasing prices of fossil fuels the automotive industry will be challenged by the strategic move in changing to an

electric drive train using renewable energy. Another two mega trends, i.e. increased safety demand, e.g. zero accident car, and internet access anytime and everywhere, will lead to enable the connectivity to the internet within all vehicle categories. In some countries government regulations will demand safety connectivity as well.
In any case the environment for Tier one suppliers will change and they have to adapt their business model and gain new competences to cope with many new competitors in the sense of Porters Five Forces, see (Hüttenrauch & Baum. 2008: page 74).

Globalization

The globalization of the automotive business is evident and influencing every company involved in the value chain. The market for vehicles is still expanding after the recent set back during the economic crisis in 2008 and 2009 and a shift from the saturated markets in the EU, Japan and US towards the BRIC countries is evident and the production capacity will follow the local market demand, see (Becker 2006: page 98). In addition to that a further concentration of players in the value chain will take place, i.e. reduction not only of the OEMs but of tier n suppliers as well, e.g. the current number of 5,500 suppliers will shrink to about 2,800 by 2015, see (Becker 2006: page 168). The globalization of markets and the individualization of demand are also leading to more complex manufacturing methods and specialized means of production, see (Becker 2006: page 64) and further "*This is causing an ever greater specialization among the links in the added value chain. Those who cannot afford this specialization must withdraw.*" Heneric in (Heneric et al. 2005: page 33) describes the automotive industry going through two major developments, i.e. globalization and restructuring.

Cost pressure

The international competitiveness of the automotive industry is determined by price and cost factors, i.e. the cost pressure will increase and with the rigid management of the value chain by the OEMs the (Cleff et al. 2005: page 141). As a consequence the production and labor intensive work, i.e. development and engineering tasks, move to countries with lower wages, see (Becker 2006: page 119). Becker recommends as a strategy for tier n suppliers to react on this trend two directions to follow, i.e. to produce cheaper and be in the cost leader position or to innovate more and be the technology owner. Both approaches follow the main goal to increase the share of added value build into the final vehicle.

Innovation

Innovation is the most important factor for OEMs and tier n suppliers as well to attract new customer and achieve similar margins as in the past. Most of the new innovative product features are enabled by electronic systems and modules in the vehicle, see (Hüttenrauch & Baum 2008: page 223). "*Demand for the latest technology—safety equipment, entertainment systems, and communications devices—continues to drive growth in automotive electronics*" (Standard & Poor's) and therefore new products and features will become one of the most influencing factors for business success in the industry. "*The demands on development and construction departments no longer show a linear, but a progressive growth rate in the complexity of production and ever shorter innovation cycles*" (Becker 2006: page 65). The industry will see two different ways how companies will use innovation in their business strategy, some will become product innovation leader and they will have to invest heavily in new technologies trying to catch early a significant market share to regain their investment. The other group will focus on process innovation with the goal to produce a certain feature with an unbeatable cost advantage and win market share over an intense price competition, compare (Hüttenrauch & Baum 2008: page 54). The type of innovation is important only "value innovation" creates new demand by increasing the appeal of goods or services. (Roch 2006: page 10). One example for leading innovation is the CVIS project with its goal "*Intelligent Co-operative Systems that are based on vehicle-to-vehicle (V2V) and vehicle to Infrastructure (V2I) communications hold the promise of great improvements both in the efficiency of the transport systems and in the safety of all road users*." (Ertico 2009: page1) From other industries especially the ICT area the main players want to enter the automotive business as stated by Microsoft: "*The automotive industry is at an inflection point, where software plus services will redefine the future of the in-vehicle experience, and innovation is the new currency*." (Phillips 2009: page 2) and their innovation power is the asset they pay in with. The core theories of innovation include disruptive innovation, resources processes and values, Jobs to be done, value chain evolution, schools of experience, emergent strategy theory detailed by Christensen in (Christensen et al. 2004: page XV). In the context of the automotive industry innovation is the development and economic exploitation of new or improved products and services, and the optimization of business processes and it continuously redefines markets and opens up new sectors of economic and social activity, see (Cleff et al. 2005: page 134)

Innovation cycles

Within the automotive industry there is a two dimensional trend in reducing single product life cycles on the one hand and to increase the number of niche products and related higher number of new development projects on the other hand. Nearly every electronic based product experiences shortened lifetime and replacements will be introduced with an increasing pace, see (Hüttenrauch & Baum 2008: page 234). Especially in the automotive sector of the economy with product life times of five years average the changes towards the short product life cycles from consumer electronics or communication devices will have dramatic consequences for all members in the value chain. "*This means that innovations must be aligned to all the players involved along the added value chain, to ultimately be successful in the market*." (Becker 2006: page 179)

Value chain development

"*Global value chains analysis typically begins by dividing industries into two broad types of firms: lead firms and suppliers*." (Sturgeon et al. 2009: page 16) Within the automotive industry the complexity of the value creation network decreased over the last 100 years from several hundred automotive companies to a few global operating OEMs. (Basole & Rouse 2008: page 56)

The existing value chain in the automotive industry is shaped by the strong position of the OEMs. The OEMs control the upstream side in the value chain consisting of tier one, tier two and tier three suppliers. The complexity of products increase towards the OEM, i.e. the tier three supplier supplies just simple components or provides only single production steps, e.g. heat treatment. A detailed description is given by Cleff in (Cleff et.al. page 141). The downstream in the value chain is dominated by the OEMs as well. Distribution centers and dealer outlets are strongly linked to the OEM and in the end localize the global industry. "*New forms of cooperation in the automotive industry, such as co-ops and innovation networks, are a clear sign of intensified competition, where the companies involved form alliances for specific purposes in order to survive*", (Becker 2006: page 33). Becker identified that change in the existing hierarchy between OEMs and tier n suppliers and a replacement will take place until 2015, see (Becker 2006: page 192). Especially in the field of product development with non automotive industry members this development from the classical linear value chain towards a value net had happened already, compare Microsoft’s Partner ecosystem for their Microsoft Auto

4.0 platform including silicon suppliers, software vendors, system integrators and training partners. "*The ecosystem connects you with Microsoft, tier one suppliers and other partners in a thriving community of Microsoft platform expertise. In addition, it is a channel to find partners of every type, all around the world, at every phase of the development cycle and provides benefits to help you find and support your next customer*." (Phillips 2009: page 12). There is a changing industry environment for automotive players. The rigid value chain between OEM and tier n suppliers will be broken up by new entrances and complementary contributions from different industry players, e.g. ICT, telecommunications, mobile phone service providers. (Phillips 2009: page 12) New alliances in the area of communication technology are necessary because know how, skills and technical resources are generally missing in the automotive industry. The experts are available around the globe and are eager to expand their own value creation and business models to the automotive industry. "*The current reorganization processes in the car industry are similar to the developments that characterized the PC industry about 20 years ago*." (Dietl et al. 2009: page 25). The development from basic value chains towards more complex value nets is described in (Loss & Crave 2009: page 521) with tangible and intangible value is created by individuals and various organizations. Rishi recommends the following strategic development for OEMs, "*Automakers will need to develop alliances and partnerships aggressively, both within and beyond the traditional boundaries of the industry. Today, divergent viewpoints among various industry segments threaten critical collaborative factors such as adoption of common standards, information management and data ownership*." (Rishi et al. 2008: page 2). The vertical and horizontal cooperation's within the automotive industry will be extended over the existing industry boundaries, see (Hüttenrauch & Baum 2008: page 209).

Outsourcing

For further cost improvement and company concentration on core competences outsourcing is one strategic step. As mentioned in (European Commission 2009: page 4) this lead to higher productivity as well, "*First, the outsourcing of services from manufacturing has recently intensified and partly explains why productivity in manufacturing has grown faster than in services, maintaining a strong share of manufacturing in value added despite a contraction in employment*." (European Commission 2009: page 4) For tier n suppliers the outsourcing trend leads to the necessity to increase the innovative research activities. "*Many suppliers cannot*

afford the higher investment and organizational costs necessary and are taken over by more financially powerful competitors – also increasingly by financial investors." (Becker 2006 page 167). Becker also states the following "*The suppliers will be forced to take on new development and production tasks for the OEMs, and to constantly create new innovations, to adapt their world-wide locations increasingly to the changed regional structure of the OEMs*" in (Becker 2006: page 173). "*Manufacturers that follow an extensive outsourcing strategy without keeping control over suppliers will lose differentiation potential and will no longer be able to appropriate an adequate proportion of the values created. They may face the same destiny as IBM in the PC industry*" (Dietl et al. 2009: page 45). On the other hand this opens opportunities for tier n supplier and new companies entering this market. The tier one supplier will increase their competences and contribute to the brand creating value chain, as described in (Hüttenrauch & Baum 2008: page 208). Outsourcing is not trend specific for automotive industry, in the bicycle industry the modularization of components lead to an outstanding market position of Shimano, see (Dietl et al. 2009: page 28), with a significant part of the value creation.

Trends from the ICT industry

Focusing on the mobile communication part of the ICT industry the growth is still continuing. According to the ITU figures from 2009 there are more than 4 billion cellular subscriptions worldwide, see (ITU 2009: page 3). "*Connectivity and lifestyle trends will change the ways cars are used. This experience will be a key differentiator in attracting consumers, especially in the areas of driver assistance, safety and service*." (Rishi et al. 2008: page 7) "*The car will have to interface with other tools to keep pace with (and leverage) the fast moving consumer electronics industry.*" (Deloitte 2009: page 11)

A strong requirement for the automotive companies is to understand the development in the ICT industry especially the market development of smart phones and its impact towards navigation, connected telematics features. Many studies predict that *"… the smart phone will quickly become a key consumer device for multiple feature sets encompassing; communications, wireless Internet, GPS; entertainment and media; 'apps' (applications) and apps stores*." (Lanctot 2010: page 1) The user will get control to select the application running on his device, i.e. the switch from SMS service towards application download for a smart phone, see (Verkasalo et al. 2010: page 243).

Applications for smart phones are intangible products without any physical form and they add to the three classical economic factors, i.e. capital, land or labor a fourth factor knowledge (Kittlaus 2009, page 97). The use of digital media will support network organizations and it is expected that they take the leading role in economic and social innovations, see (Möller et al. 2002, page 1). Based on the further improved computer hardware and software including easy to use tools to develop applications the users´ ability to innovate is improving radically and rapidly, see (Hippel 2005: page 121), and will lead to many new and small players in the value net.

Customer trends

Further individualization leads to more and smaller product niches for existing vehicles. Becker mentions that OEMs are looking for new niches and introduce new models for them. (Becker 2006: page 76) and he adds "*Enterprises which can cope with the balancing act between customer and market oriented innovations and economically interesting solutions are the ones which are successful. The key to success is the strict alignment to the client's needs*." (Becker 2006: page 179)

The need to be connected and “always-on” impacts the way consumers live and the way business is transacted. Whether it’s through a high-speed broadband or dial-up connection, access to the Internet has become synonymous with access to markets, information, social networks and education, see (ITU 2009: page 16).

2.2 Internal Analysis

Derived from the company strategy outlined in the annual report from 2008 the business model is developed in several steps. After the takeover of Siemens VDO by Continental in December 2007 the complete company strategy was updated and presented to the public within the annual report of 2008. The product portfolio of the business unit Infotainment and Connectivity within the division Interior of Continental Automotive ranges from hands-free systems, simple radios to telematics units and multimedia systems with touch screen and internet connectivity. The division is the worldwide market leader with telematics systems and instrumentation products. One major potential growth opportunity is clearly the development of connectivity systems for vehicle to network to one another and to the infrastructure.

In the annual report 2008 the growth opportunities were clearly identified and one of them is the core task of managing the information flow within a vehicle and to its environment, see (Continental 2009 page 32). Based on the combined knowledge

from the complementary units from Continental and Siemens VDO newly formed into the Continental Interior Division with its driver information and telematics systems the strategy was focused on information management between vehicles, driver, passenger, road infrastructure and any other mobile devices, see (Conti 2008 page 197). It was clearly identified that the car was one of the last white spots of internet usage. The already given coexistence of mobile communication devices, i.e. mainly mobile phones, and vehicles was manifested in products like hands free kits and some build in Bluetooth enabled infotainment systems. Additionally some telematic services were used in the commercial vehicle and fleet management markets. Navigation systems and portable navigation devices fulfilled another specific customer demand. A logical next step for the business development is the convergence of these single devices and dedicated services into one product. Continental has already gained a lot of experience from the so called simplify your drive project. Therefore it was clearly decided to setup a cross domain project with cooperation between OEM, supplier and other partners without any holdbacks. It was obvious for Continental that the mash up of automotive, consumer electronics and communication industries will influence the way a tier one supplier was used to perform business so far. Not only the continuously increasing computing power of mobile devices, e.g. smart phones, has to be extended to the wider temperature range required by automotive electronic systems, but the expectation from the end customer has to be fulfilled as well. This is even more difficult because the convenience and comfort of consumer electronic products have to be transferred, too. One of the goals is to provide a complete solution for the OEMs including the infrastructure in the vehicle on the one hand and to provide the online services on the other hand. The end customer should be able to have easy access as already used by app stores for in car applications as well. An additional aim was to establish a developer community and provide first all necessary tools, i.e. software development kit (SDK), emulator, vehicle simulator and a generic API including different skins, i.e. user interfaces. An important feature of the concept is the app certification by Continental, this will assure the OEMs that only proven applications run in the car and help the developer community to distribute their applications. Comparable with the app stores established by Apple or Google Continental will provide a similar concept for their own apps.

A first announcement was made in June 2009 during the Telematics Conference in Detroit US and AutoLinQ^{TM} was started as an internal development project in June

2009 as well. At the Consumer Electronics Show in Las Vegas in January 2010 a first presentation was given and further plans were disclosed to the public. A first vehicle with a running AutoLinQ^{TM} system was shown by Continental and Deutsche Telekom at the CeBIT in Hannover in March 2010. In June 2010 at the Telematics Conference in Detroit Continental announced a partnership with six additional companies to push the technology alliance for AutoLinQ^{TM}. The partners are Deutsche Telekom, INRIX, Navigon, NAVTEQ, Pandora and Ygomi, see (Gehrmann 2010: page1).

2.3 Description of the methodical approach

Before evaluating and analyzing a business model the economic environment has to be investigated. Several methods are used in scientific and business world.
An industry analysis is performed using two models, i.e. Five Forces and Value Net analysis. In this chapter a description of both methods is performed and the differences and complements are discussed. Further the tools used are described and the relevance in the industry analyzed is discussed. References from the automotive and telecommunication industry are given and their findings are used in later chapters. Other methods not used in this master thesis are PEST, PESTLE, SWOT, Scenario Techniques, Value Chain, Blue Ocean Strategy and IWK-Survival-Index (ISI). The PEST method is used in (Hüttenrauch & Baum 2008: page 5) to analyze the external conditions independent from the company goals. The SWOT method is used in (Heneric & Sofka 2005: page 4) to match the resources and capabilities to the competitive environment of an industry. The motivation for developing the IWK-Survival-Index is given by Becker, "*The IWK-survival-index was developed in order to be better able to assess competition resistance and survivability of the automobile companies involved*." (Becker 2006: page 137). The Blue Ocean strategy is seeking to develop customer demand in new markets and to avoid tough competition. According to the detailed analysis from the Dutch retail industry in (Burke et al. 2009: page 20) a certain level of synthesis between Blue Ocean strategy and the Porters competitive strategy is given. In other words a company will stay in the competitive market (red ocean) with a high price pressure until it can move to a blue ocean market with a new innovative product.

The decision to use the five forces method and complement it with a value net analysis is based on the ease of use of both concepts and the nearly perfect

mapping of the parameters identified in the analysis to the required input for the design of the business model.

The limitation of the five forces as described by Besanko in (Besanko et al. 2007: page 313) showing that cooperation between different companies is not analyzed in detail. It is recommended to perform a value net analysis in addition. This method is described by (Nalebuff & Brandenburger, 1995: page 58). The usage of both approaches is described in (Parolini 1999: page 168) including a detailed example of the tools. This leads to further investigations based on the value net analysis. Here the focus is not only on the threads to a company's profit from competition but more on the value generated by cooperation within an industry.
With the even more complex business relations especially in the ICT industry some further limitation are identified, e.g. "*Critics found that Porter´s approach did not adequately describe the multidirectional nature and complexities of the potential myriad of business to business (B2B), business to consumer (B2C) and emerging consumer to consumer (C2C) relationships....*" (Basole & Rouse 2008: page 55)

Examples where the five forces analysis is used can be found nearly in every industry sector worldwide. This is because the method was already introduced in the mid 1980´s by Michael Porter. It is an easy method to identify the main factors that affect a company's business. Two dimensions are taken into consideration as shown in figure 2, on the vertical the competitive relations and on the horizontal the trading relations are analyzed. The method is using qualitative data only and if quantified factors are needed it has its limitations and other methods have to be used. In the usual cases the five forces method is used to identify the current state of competition and the future development of an industry sector, i.e. the same set of questions has to be answered twice for today's status and for a future trends.
The Five Forces Analysis method is used in various studies and industry analysis. In the mobile voice services business it is used to identify the future structure of the industry. (Lindqvist 2007: page 45). The analysis of a branches competitive efficiency and profitability the Five Forces method is used in (Becker 2006: page 175) as well. It is used in several PhD and master thesis related to the automotive industry, e.g. (Mangold 2006: page 11) and (Davis 2007: page 25) with detailed data and sound conclusions.
Becker mentions the usefulness of the five forces in (Becker 2006: page 175) "*On consideration of the automobile supply industry according to these five criteria, the*

great extent of the prevailing crowding-out competition can without doubt be anticipated." And this is mainly caused by the purchasing power within the value chain, i.e. OEMs and tier one suppliers. Another study is covering FIAT as company in the automotive industry uses several different methods, e.g. PEST, SWOT, Five Forces and Value Chain. The main goal is to identify the driving factors that influence the FIAT performance. (Cammarata et al. 2006: page 7)
According to Helander "... *the empirically grounded model developed for value-creating networks, with its various elements, aids in the establishment of a number of guidelines for managerial decision-making by identifying the influencing factors and views from which to consider value-creating networks*.", see (Helander 2004: page 214)
For the competitive efficiency and profitability of a branch, five competitive forces are decisive, which have to be taken into consideration when choosing the right company strategy. These so-called five forces are internal rivalry of existing competitors in the branch, entry of new competitors, threat from substitute products or complements, negotiating power of suppliers and of purchasers, as shown in figure 2. The first step is to identify the market segment where the company is in and to analyze the internal rivalry in the next step. The details are explained in chapter 3.1.4.
Usage in Automotive Industry, usage in telecommunication industry, is proven by the literature, but can this method be used in an overlapping market segment of these two very different industries as well. There are some prerequisites that must be given to apply Porters five forces study.
A list of circumstances, e.g. Emerging Industry, uncertainty of technology, high initial cost, cost reduction, first time buyers, Spin-offs, startups, short time horizon, early mobility barriers, industry development, absence of infrastructure, absence of standardization, customer confusion, early or late markets, performance or cost advantage, switching costs, support services, government regulation, Strategic choices, shaping industry, industry development, changing role of suppliers and channels, mobility barriers, timing the entry, is taken from (Porter 1980: page 215 to page 236).
Especially the given fact of a global industry is elaborated by Porter in (Porter 1980: page 275). In this analysis the uncertainty of technology and absence of standards is a clear indication for an early market and therefore Porters method is applicable.

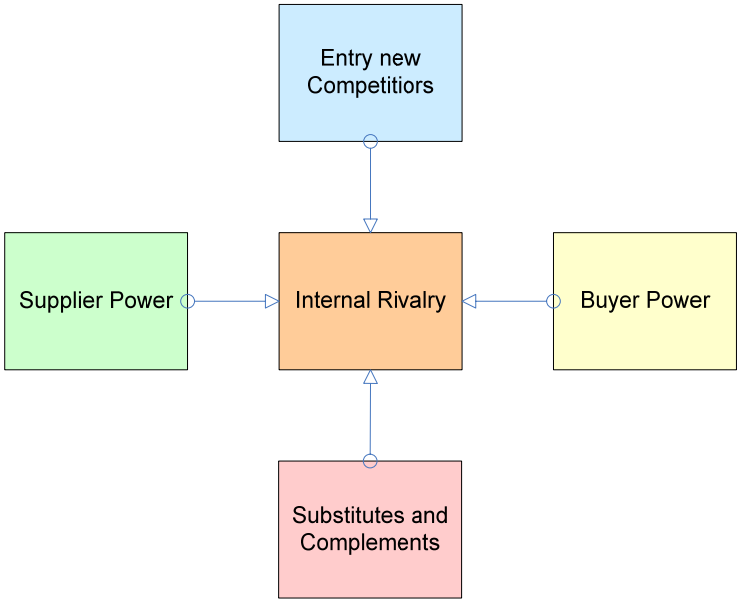

Figure 2.Five Forces Analysis

Porters Five Forces model is useful as long as the majority of competitors operate in a similar value chain, see (Parolini 1999: page 154). If the market segmentation is difficult to define because increasing interrelation between separated industries is happening the classical analysis becomes more and more obsolete. The hypothesis that the competitive system is based on definite existing products, substantial homogeneity of competitors and clear boundaries of the system cannot be granted in this case where two industries, i.e. automotive and telecommunication, influence each other significantly and as recommended by Parolini in (Parolini 1999: page 168) a solution is to analyze single nodes in the value net.

Market definition in this context is a combination of two existing markets which will influence and overlap in future. The user acceptance in this particular case is very important, because otherwise the services will not be used and no customer will pay for it. To provide this ease of usage many different players have to establish a standard for these applications, as clearly stated by Rishi. "*Companies throughout the value net, including external players such as government and telecommunications companies, will need to work together to establish a common platform that enables vehicles and components from different manufacturers and geographic locations to communicate seamlessly*." (Rishi et al. 2008: page 12)

On the one hand the automotive market with its worldwide distribution and segmentation into several product niches including the installed base of vehicles and on the other hand the emerging smart phone market which is one enabler of the newly available location aware service functionality an uncountable number of potential market segments are opening up. Derived from the market definition the use of Porters Five Forces Analysis can be aligned to the characteristics of this industry, i.e. global competition, emerging industry and many new entries into this market.

The linear value chain is not sufficiently describing the new value creation architecture, because several additional players, i.e. cooperating competitors, related service providers, banks, insurance companies, add their contributions for the final product, see (Dietl et al. 2009: page 44). Some benefits a company can gain when it follows a cooperation strategy are shorter time to market, higher flexibility and lower risk due to less resources used from a single company and higher quality and learning curve, see (Meffert et al. 2008: page 63). In addition the success of a business depends more and more on the ability to cooperate with some of the competitors from former times, see *"... firms in modern management terms are rather regarded as network elements than as isolated entities. Therefore the organization and optimization of inter-organizational structures is a prerequisite for successful business*." (Cleff et al. 2005: page 140)
"... the traditional view of a value chain introduced by Porter, which assumes a linear value flow from raw material providers to manufacturers to suppliers to customers." (Basole & Rouse 2008: Page 55)

The focus is on the five main factors influencing a company in the market. The point of view is how the forces may reduce a company's revenue driven by the competition either market internal or from substitutes or new entries in the market. The first step is to setup the value network. Which combines in this case two existing well established value chains, i.e. on the one hand the automotive industry and on the other hand the mobile communication industry. The goal is to identify the new area in the value net that generates new revenue and cash flow. New opportunities in the market have to be investigated including complement products and services from market participants. After identifying the node of the most interest in the value net! Based on the node identified a five forces analysis is developed. The tools needed in the analysis are divided into the five areas: Internal rivalry detailed in market share, market development and growth potential, products and

services definition, price, cost structure of the competitors, price elasticity and exit barriers. Market entry analysis includes the following details entry barriers, government protection, brand loyalty of customers, know how accessibility network externalities, i.e. installed base of car brands and mobile phones, and large scale product launch like the iPhone launch performed by Apple, post entry competition. The substitutes of products and services are characterized by availability and price value, i.e. substitute versus existing product. Supplier and buyer power are defined by the actual concentration in the upstream and downstream of the value chain. Finally the cooperation between the companies is the last step in the analysis giving new insights of possible revenue generation.

2.3.1 Structure of Five Forces Analysis

In this chapter the basic structure is defined and the general information is collected to be used in the further analysis. The prerequisites for the industry environment are the following criteria's, fragmented industry, emerging industry, mature industry, declining industry or global industry must be fulfilled.

In a fragmented industry no company has a significant market share which is true for the automotive industry. In the mobile phone industry Nokia has a larger market share but focusing on the smart phone market another fragmented market is identified therefore this criteria is valid. In addition there are low barriers for market entries, economy of scale is not valid here, high transportation costs, high inventory costs, heavy creative content, local image and contacts, higher exit barriers and newness of product or service. The derived strategy is to create economy of scale, standardized market needs and modularization, neutralize fragmentation, e.g. Mc Donald’s and acquisition of local companies.

In emerging industries are no rules at all. Any values have to be established. This market has an initial small size and is very new. There is a great uncertainty regarding the technology that will lead the market development. Wide variety of strategic approaches is given. Different product categories and configurations try to win customer attention. No one knows all competitors. Market share data is often not available. High initial costs relate to a steep cost decline and great learning curve. Newly formed companies and spin offs serve first time buyers.
In an emerging market early mobility barriers are proprietary technology, exclusive access to distribution channels, access to raw materials or skilled personal and risk

due to increased opportunity costs. The market is clearly identified as an early developing market on a global base. This global approach has advantages on one side, e.g. economy of scale for production and services provided, and on the other side some additional influencing factors, e.g. complex segmentation of markets and distribution channels, product differentiation and rapidly changing technology.
New market disruptive innovations have the greatest potential for long term industry change and signals are emerging growth market, acceptance of performance imperfections of customers and existing non consumers, see (Christensen et al. 2004: page 8)

A first step in the analysis is to define the market. In this case the overlapping automotive industry with its number of vehicles sold in a large number of segments, i.e. product class and regional markets, has to be merged with the data from the telecommunication industry with the focus on the smart phone segment. In addition the aftermarket segment of the automotive industry with round about 700 million vehicles worldwide is potentially ten times larger. In the telecommunication market only the services and apps downloaded are of relevance. The revenue stream is diverse and many different players contribute with their innovation capability. First the smart phone vendors like Nokia, Apple, HTC, Motorola, RIM, Samsung and many more deliver the base device for all the applications and services used later on. Second the operating system supplier like Apple, Microsoft, Google, Symbian, QNX, WebOS from HP former Palm are the key enablers for the increasing application development business already existing for the smart phone eco system. Third the connection service providers like T-Mobile on global scale and many more acting locally provide the infrastructure to stay connect to the internet. In the telecommunication industry their strength is the customer base and ability to perform the CRM activities, e.g. billing. Considering the contribution from automotive industry the most important role have the OEMs. With their strong brands, e.g. BMW, Daimler, Toyota, VW, GM and many more, they already established telematic services for their customers based mainly on proprietary technical solutions. This gives them clearly the incumbent role in the analysis and requires appropriate strategic actions. The second position belongs to the tier one suppliers either in close cooperation with certain OEMs or conducting business in an independent way. With some limitations they can use their know how to gain a larger part of the value creation increasing their revenue and profit. Especially the tier one suppliers not linked with a dedicated OEM can their independent position in the value net to

establish a generic solution that can become a standard. Further important are the engineering service supplier because the knowhow to develop applications for smart phones is not seen as the ultimate key resource for OEMs and some of the tier one suppliers. The distribution network and dealer on the other side have access once again to the end user who buys the car. Last but not least the developer communities for the existing smart phone platforms, e.g. Apples iPhone, Googles Android™, are the ones with the know how to develop applications asked by the customers.

Internal Rivalry/ The intensity of competitive rivalry

For most industries, the intensity of competitive rivalry is the major determinant of the competitiveness of the industry. In this case other tier one suppliers are considered here. One strategic concept is to keep a competitive advantage through innovation. Another concept is to follow the blue ocean strategy and to develop new markets without strong competition, see (Burke et al. 2009: page 3). For the aftermarket segment it is also important if the tier one supplier has a recognized brand with an online presentation and connected to this is a clearly visible IPR contribution within the OEM solutions. Another point is the switching cost for the customer, i.e. here it means the effort for the OEM to change the supplier on the one side and for the end user to change the car or mobile phone on the other side, and they can vary widely. Becker in (Becker 2006: page 175) determines the internal rivalry as "*… merciless crowding-out competition in the automotive industry.*" Competition has many different dimensions and the most important one are quality, pricing and non price dimension, i.e. innovation capability, time to market, flexibility and customer orientation.

Substitutes and Complements/ The threat of substitute products or services

For this market no standard is defined so far and this leads to many different solutions that are in general incompatible to each other, i.e. a new smart phone or a new car will not work seamlessly together with each other. Some of the OEMs have a proprietary solution with a closed eco system. Some of the features can be offered not only for one hardware platform, e.g. smart phone or build in navigation system, and therefore a number of complementing product is given. The customer can switch to alternatives or is expecting that some applications work in the same way running on different platforms, e.g. smart phone, PND or proprietary solution. In fact

no customer will use three different navigation systems in parallel, e.g. turn by turn navigation on the smart phone versus planned trip navigation on a PND.

In general the Open Source Software Marketplace is characterized by an infinite supply, i.e. zero duplication costs, and producers are able to create entire new markets, see (Brent 2007: page 35), which results in an uncountable number of similar applications available in various app stores for different products. The existence of products outside of the realm of the common product boundaries, i.e. within a developing and innovative market, increases the propensity of customers to switch to alternatives. The price performance varies over a wide range as well, e.g. connected drive applications from the premium brands are based on a monthly description and priced relatively high compared to smart phones with flat rate internet connection contracts. On the other hand the build in solution has a different quality and design level compared to smart phones with an aftermarket car kit.
For applications (Apps) the threat is high, i.e. many individual developers and SME's will bring new products to the App Stores, e.g. App Stores with more than 30 thousand applications are proofing this. Buyers who download apps are willing to change from one app to another very easily.

The hardware box installed in the vehicle to provide the connectivity and data will only be replaced on a medium level by build in navigation systems or bluetooth enabled infotainment systems with the limitation that some data cannot be provided to an external development partner easily. This might help OEM specific solutions to gain a broader acceptance of their proprietary solutions. Another replacement is a diagnostic connector with a wireless connection to the smart phone that is attractive to people who are affine to technical solutions and improvements of the cars performance.

Entry/ The threat of the entry of new competitors
Profitable markets that yield high returns will draw more firms. This results in many new entrants, which eventually will decrease profitability. Unless the entry of new firms can be blocked by incumbents, the profit rate will fall towards a competitive level (perfect competition). The existence of barriers to entry is high if patents, regulations lead to a significant initial effort for new entrants. The most attractive segment is one which entry barriers are high and exit barriers are low. Few new firms can enter and non-performing firms can exit easily. In this case there are low

barriers but still existing due to localized content and different OEMs. The differentiation of products increases the barrier because at the moment several platforms and OEM solutions has to be covered. The actual switching costs are very low and the initial investment is low as well compared to other automotive technologies. The existing customer loyalty is increasing the barrier for new entrants. In both existing industries are strong OEM brands, e.g. Apple, Nokia, BMW, Daimler, GM, and so on. A learning curve advantage is nearly similar for all companies entering this new market, i.e. they have to build up the knowhow from the other industry. The government regulations might have some significant impact for some of the new competitors because the ban of mobile phone usage in the car without a hands free kit might be extended to the ban of the use of a touch screen device while driving a car. The expected industry profitability compared to the established automotive and telecommunication market varies with the solutions offered, i.e. app developer will see no significant change unless they are partnering with some automotive OEMs, but for the OEMs it is a possibility to generate revenues by selling subscription and therefore increase the customer retention. For setting up the distribution channel the entry barriers are rather low for the targeted end customer. For the developer community this is clearly completely new for the automotive industry. There is definitely a high entry rate from other companies comparable to the attractiveness of the smart phone app store market.

Once again this is proving the changing value chains from to mature industries, i.e. automotive and telecommunication. The new industry cannot be presented in a linear flow of value creating activities anymore. The entry in this new market will be further eased by the availability of IT infrastructure, e.g. personal computer, development kits and other tools needed for the engineering work, see (Hippel 2005: page 13). For the automotive industry the barriers are clearly higher and only a few new entrants are existing mainly due the complexity of the vehicles, see (Mangold 2006: page 11). The new entrants will bring new and innovative solutions to the market and according to (Christensen et al. 2004: page XV) they can follow two directions, i.e. first low end disruptive and new market disruptive innovations, in opposite to the sustaining innovations from the incumbents.

The entry decision for a firm mainly based on the investment, e.g. sunk cost for equipment, licenses, knowhow of human resources, and the post entry profits, see (Besanko et al. 2007: page 289), that are expected to exceed the upfront investment.

There are many different barriers a company who enters a new market has to consider, e.g. high fixed investment, price level below marginal cost for the entrant, economy of scale for the incumbent. The opposite is the accommodated entry condition, as listed in (Besanko et al. 2007: page 289), in markets with growing demand or technological changes.

Buyer Power/ The bargaining power of customers (buyers)

The negotiating strength of the purchasers, in this case the OEMs or module suppliers, is causing increasing competition along the whole added value chain, see (Becker 2006: page 175). This goes hand in hand with the high degree of buyer concentration in the upstream of the automotive value chain but can also be found in the limited number of app stores with significant download numbers. This dependency in the existing distribution channels puts the buyer in a comfortable position within the industry. The buyers switching costs are low for the end user downloading an app and moderate for the OEM changing the system in the vehicle or selecting an aftermarket solution for anyone else. The buyer information is very high and price and feature comparison is nearly 100% due to the internet distribution. The price sensitivity is a given for the end user who is used to test an app for free for a certain time or will accept some advertisement included in a free service. The price sensitivity is different for build in systems in new cars sold because the price increase is just a minor percentage of the car price for the premium brands. The OEMs or tier one supplier might backward integrate some of the features especially the dedicated hardware solution into the existing body controller ECUs. Non consumers are a further step to investigate customer behavior. "*This exercise pushes organizations to look beyond the conventional boundaries of their business*." (Roch 2006: page 66). Some examples for actual non consumers in this market are anyone using public transport, passengers, police, and government.

Supplier Power/ The bargaining power of suppliers

The bargaining power of suppliers is also described as the market of inputs. Suppliers of raw materials, components, labor, and services (such as expertise) to the firm can be a source of power over the firm, when there are few substitutes. Suppliers may refuse to work with the firm, or, e.g., charge excessively high prices for unique resources. For the tier one supplier in this case the selection of the operating system vendor is crucial and here the few companies have a clear bargaining power. An open source concept is therefore preferable because this can

reduce not only the initial investment but furthermore ease the adoption of know how. In the automotive industry for SW components only a single source solution is available due to existing partnerships and cooperation's. The supplier competition is given in the area of OS vendors because it is transferred one to one from the smart phone market. App developer will develop for every platform offering a minimum number of downloads and later revenues. Established R&D partnerships will also be difficult to discontinue or change. The thread that suppliers will forward integrate the activity of the buyer is limited for the tier ones.
The Make or Buy decision is crucial in this case for the tier one supplier. The OEMs are in a good position because there is still a high number of a tier n supplier and they still have the possibility to produce some system components in house, see (Mangold 2006: page 11).
The vertical boundary of a firm is mainly defined by the decision what to buy and what to make in house. In (Besanko et al. 2007: page 105) this is detailed the benefits and costs are discussed. A make or buy decision tree based on the framework developed in (Besanko et al. 2007: page 131) can be used to further stimulate the right questions for the strategic decisions of a company. Some of the criteria are for making products and services in house are incomplete contracting, transactions costs and holdup problem. On the other side reasons to buy are economies of scale, agency costs, e.g. administrative and slack effort. There are also alternatives to vertical integration for companies, e.g. make and buy for a split in quantity to be produced in house, strategic alliances or joint ventures. One example described in (Besanko et al. 2007: page 157) is the Japanese Keiretsu concept of subcontractor networks.

The five forces framework analysis an industry and a company can identify its position within the industry targeting to establish a competitive advantage, i.e. earning more profit. As shown in (Besanko et al. 2007: page 254) the value created is shared between the company and the consumer and the competitive advantage is difference from the achievable market price and the related costs for the company compared to its competitors. Therefore it is essential to understand how the value creation for the customer is performed and what costs are related to that for a company. For the strategic positioning a two directions are possible on the one side the cost advantage and on the other side the benefit advantage, i.e. functionality of product or service. A company has to decide on the strategy either cost leadership or innovation leadership.

Market data phase growing, mature or declining

Another decision is on the market segment coverage, as shown in (Besanko et al. 2007: page 378) the broad coverage leads to a full product offer for all customer groups. This is especially in the global automotive industry for the tier n suppliers due to the increasing globalization as discussed in chapter 3.1.1. The other option is to follow the focus strategy and to restrict the companies offer to a single customer group, one product category or a geographical specialization. In the long run a company has to achieve a sustainable advantage over its competitors and new entrants in a selected market. One source is the development of a new technology that can create new markets on the one side or replace existing products. According to Christensen in (Christensen et al. 2004: page XV) they are called disruptive innovations. Several case studies are given by Besanko in (Besanko et al. 2007: page 438) to underline the importance of innovation capability of a company as its main differentiator for competitive advantage.

2.3.2 Value Net Analysis

In this chapter the five forces analysis will be extended into a value net analysis to tackle some of the limitations mentioned in chapter 2.3., e.g. cooperation of different companies not taken into consideration, value creation in a non linear flow within an ecosystem.

The development of value net modeling can be derived from Michael Porter´s work, see (Saukkonen 2004: page 95). New tools to describe an industry and to derive a company strategy in a more complex environment where material and information flows are separated are needed and the value net analysis is used in these cases, see (Saukkonen 2004: page 96).

In the automotive industry the lack of standardization, the need of systems integration and the complexity of many vehicle sub-systems require to structure value chain linkages, see (Sturgeon et al. 2009: page 20). The method is used in (Helander 2004: page 85), to describe the industry. Another reason for using this method is given by Basole, "*Based on this line of reasoning and the aforementioned literature, we thus model services ecosystems as value networks that include both products and services*." (Basole & Rouse 2008: page 56)

The complexity of the two markets also require in addition to the five forces analysis another tool see (Basole & Rouse 2008: page 63), especially for the end user in the telecommunication industry a wide variety of products and services make purchase decisions difficult.

"*Relationships between the firms of an ecosystem are complex and show a mix of cooperation and competition*", see (Gueguen & Isckia 2009: Page 46). Even rivaling ecosystems are becoming more the rule than the exception to the rule, e.g. several handset manufacturers and operating system vendors compete against each other. Just a few device manufacturers use more than one OS in their products, e.g. HTC uses Android and Microsoft. In (Gueguen & Isckia 2009: page 52) an example of an ecosystem map is shown reproducing the relationships between the major OS vendors, e.g. Microsoft, Palm (now owned by HP), RIM and Nokia with its Symbian OS.

In (Rishi et al. 2008: page 12) the value net for the requirements of a seamless communication of vehicles between different manufacturers is described and furthermore a value network starts with sensing opportunities to innovate in response to competitive conditions in the market, see (Abuelmaatti & Rezgui 2008: page 1)

The analysis of value creation system starts at the end user task and follows the different use cases and usage scenarios to the automotive tier one supplier and their suppliers with the goal to identify every step that adds value for the end user in the network. In this case the end user tasks are mainly retrieve information with mobile application in the car, check vehicle status, deliver data of actual trip to central server, i.e. speed, time, mileage, service interval time, use navigation functionality in any form, i.e. turn by turn or full featured telematics services, use location based services, i.e. nearest fuel station, hotel, or any other POI, use in car entertainment system and the synchronization between different devices within the car and finally use hands free features of phone. One example is shown in the following figure 3. to illustrate the basic outline of the value net of the telecommunication business. Starting at the right side with the customer and end user the main nodes with representing companies are developed. The main relations within the network give an indication of the value creation from participating members.

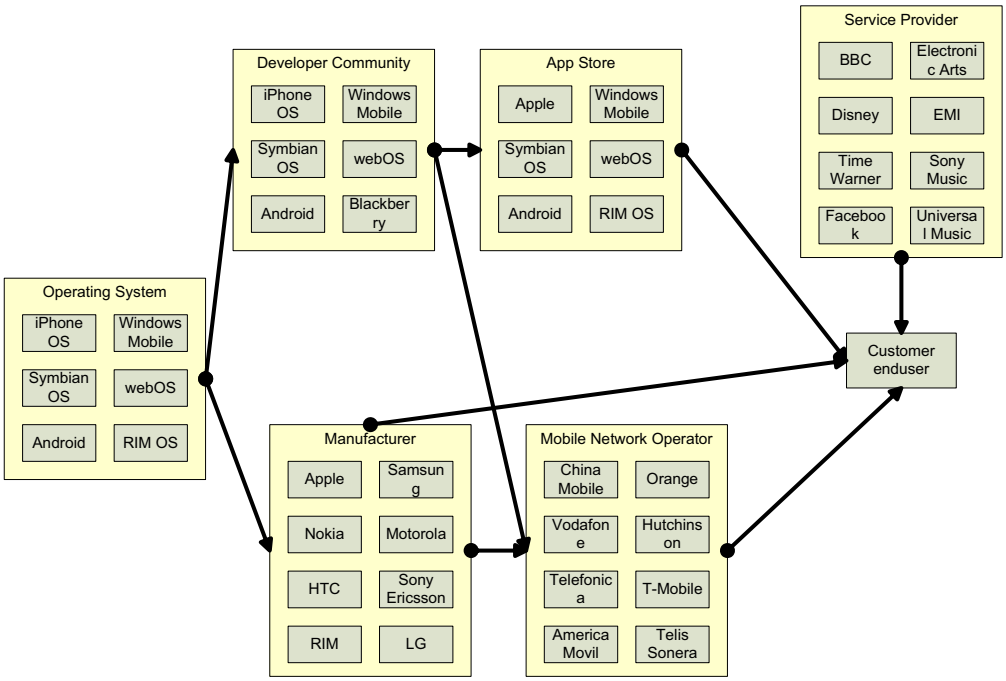

Figure 3. Value Net Telecommunication Business

New use cases for smart phones in car are for example to plan next service date in repair shop and make a reservation, participate in fuel consumption contest, use web 2.0 communities, i.e. car owner, regional car pool, facebook, linkedin trip advisor, car2gether, see Daimler application (Schindler 2010: page 1), share route experiences including recommendations as a P2P service, deliver information of route planning to tourist guides, e.g. Michelin (Cuq 2010: page 1), retrieve diagnostic status of car additional to normal status information, record driving cycle history, i.e. digital tachograph, choose cheapest fuel station along planned trip, e.g. optimization of price difference and additional distance to go, hitchhiker community, car and ride sharing, web 2.0 community service.

Different use cases for other customer groups are, e.g. company cars, car fleets, plan service interval based on real usage or mileage, plan usage of company car, digital tachograph and car pool management with detailed car data available

For car rental companies the fleet management with detailed car data available will be much more easier and less logistics costs for transferring one car to another rental office or like rental car app zipcar with no fixed rental location but available as location based service. A similar service is developed by Daimler as well.

Use cases where insurance companies use log driving performance and reduced insurance rates in a pay per use concept open up another value creation area in the ecosystem.
Establish the value net by evolving from one node to the next, i.e. start with a company and analyze supplier, customer, competition and complementator and then move to the supplier and repeat the analysis from this point in the value net, continue at the any other node until the value net is complete.
A split in mobile phone based apps and build in apps within head units, navigation systems and car infotainment systems is useful to cover more usage scenarios for the value consumption at the end user point. Within the value net the distinction between OEM and aftermarket service with their different distribution channels is necessary.
Within this innovation network it is important to identify the strategically relevant components, e.g. app, services, data, telematic box or communication device.
The definition of a value net model is derived from (Parolini 1999: page 80) with a set of activities joining to create value by flow of material, information, financial resources and influencing relations. The form of presentation of a value net is based on the theory of graphs with nodes and arcs spanning the net. Nodes represent activities and the arcs represent relationships, material or service flows. An example is given in detail in (Parolini 1999: page 162) of the electronic publishing industry in Italy. The level of details is determined by the target of the analysis, in general there is no limitation how detailed the value net is drawn. In practice a limited number of nodes will represent the value creation network, i.e. one node is a set of inseparable activities that are worth consideration, see (Parolini 1999: page 82). More nodes will be drawn near the key activities within the eco system and might be aggregated at the system boundaries. The model representing the economical reality has to fulfill on the one side the need to show the interrelation of the acting companies in the value system and on the other side not to be too complex for usability. Parolini distinguishes realization, support, external and consumption activities, see (Parolini 1999: page 87).
After indentifying the required nodes the relation between them is drawn by the arcs showing not only the physical flows of material but on the same level the information, money flows and influencing connections in any direction. Once again the level of details has to serve the goal of the analysis. Parolini recommends in (Parolini 1999: page 85) to list the connection that shows the competitive advantage, different industry configurations and bottlenecks.

According to (Kittlaus 2009: page 25) a company can select three different positions within an ecosystem, i.e. keystone, dominator or niche player. The keystone player provides benefits to the business ecosystem and enables mainly niche players to contribute in a larger extend. In contrast to that the dominator role is trying to capture value in the ecosystem and to control it. Most participants in the ecosystem are in the category of a niche player and they avoid any competition with the two others.
This analyzed model of the two overlapping industries is used later to develop and detail the business model for the tier one supplier. Nearly all the influencing parameters should be identified in the value net system and be considered and the later steps.
With the identified hotspot in the value net, i.e. where is the most important position to control the value generation with the highest influence, the company can derive strategic actions how to position itself there.

2.3.3 Business Model

In chapter 2. the basic concept of a business model was explained and a more detailed description based on the available literature is laid out in the following paragraph.
Many firms operate with a conceptually very simple business model: They supply a product that meets a consumer need and sell it at a price that exceeds the cost of production. (Grasl 2009 page 270) A more general definition of a business model is developed by Grasl "*A party's business model shows how it creates value for all the parties within its value network by defining its value logic and showing which goods and services are exchanged via transactions between these parties.*" (Grasl 2009 page 96).
According to Zott et al. the internet is one of the driving factors enabling new ways of doing business and increasing interest in business models. In the literature analyzed by (Zott et al. page 9) just less than half defines a business model explicitly. An overview is collected on page 10. The explanation in networked markets is mainly using the business model concept as found by (Zott et al. page 18)
"*The business model represents a new dimension of innovation and source of competitive advantage*." (Zott et al. page 19) With choosing the right business model is an important factor to outperform the competition. "...*business model represents a new dimension of innovation, which spans the transitional modes of process, product and organizational innovation,* ..." (Zott et al. page 22)

The business model innovation described in (Lindgardt et al. 2009: page 2) can help corporations to address disruptions, e.g. technological changes, which demand new competitive approaches. The overview is shown in figure 4. with the value proposition and operating model influencing the business model. "*The winners in BMI are not necessarily the originators of new models more often they are the ones that are the first to successfully roll out ideas that others may have originated*." (Lindgardt et al. 2009: page 5).

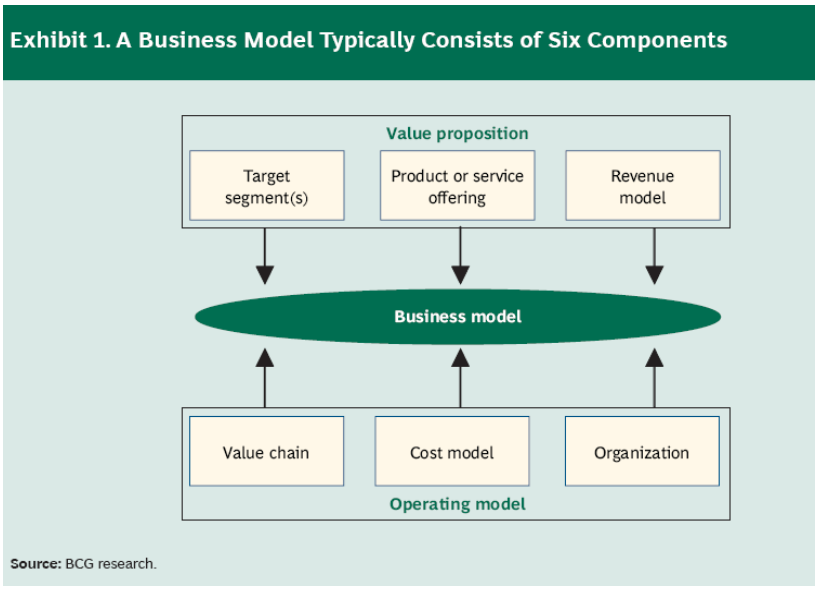

Figure 4. Business Model Innovation, see (Lindgardt et al. 2009: page 2)

The main business models identified for online services are advertising, subscription, utility, affiliate, merchant or brokerage, see (Olafsdottir 2008: page 51). Some business models can be combined to form an individual competitive advantage for a company. Additional free content can be an interesting business model as well.

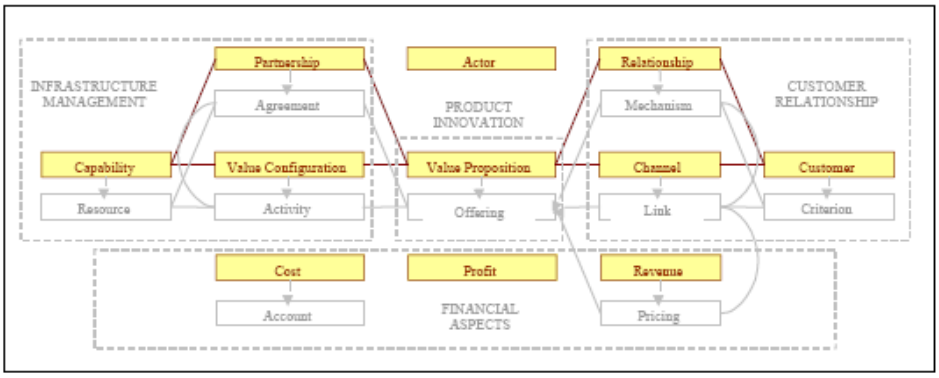

Figure 5. e Ontology, see (Osterwalder & Pigneur. 2004: page 69)

As outlined above in figure 5, business models are constructed around products, customers, infrastructures and financial issues. These pillars can be translated into four main business model blocks that are then further decomposed: Firstly, the PRODUCT INNOVATION block, which describes the value proposition of a firm. Secondly, the CUSTOMER RELATIONSHIP block, that describes how a firm gets in touch with its customers and what kind of relationships it wants to establish with them. Thirdly, the INFRASTRUCTURE MANAGEMENT block that describes what activities, resources and partners are necessary to provide the first two blocks. And finally, the FINANCIAL ASPECTS block, which describes the revenue flows and the pricing mechanisms of a firm, or, in other words, how a company makes money through the other three blocks, see (Osterwalder & Pigneur. 2004: page 69).

The phases of a business model are mentioned first in chapter 2 and will be explored in more detail in the following paragraph. Relevant for this analysis is only the design phase as defined by (Wirtz 2010: page 205) and (Osterwalder & Pigneur 2010: page 52). Osterwalder defines five patterns of business models, i.e. "Unbundling Business Model", "The Long Tail", "Multi-Sided Platforms", "FREE as a Business Model" and "Open Business Model", taken from well known business concepts and puts them into a standardized format to enable an easier reuse. (Osterwalder & Pigneur 2010: page 118).
The most relevant pattern is the "Open Business Model" where the R&D activities are not performed in house instead outside partners are involved to enable a quicker time to market. The other patterns contribute to the development of the business model only in some specific details, e.g. Freemium product portfolio, reuse the

product platform for different customer segments and unbundle for the OEMs, end user and developer community.

After selecting some patterns or detailed aspects of them the next step is to develop the design of the business model. From the initial generation of a business idea using well know creativity methods, e.g. brainstorming, 635 method, the next step requires some other tools. Osterwalder in (Osterwalder & Pigneur 2010: page 161) recommends customer insights, prototyping and scenarios.

Business models need nowadays regular nearly permanent adoption, i.e. change is the only remaining constant factor especially in the internet related businesses. The changes originated by Web 2.0 technologies were investigated by Wirtz in (Wirtz et al. 2010: page 276) "*We argue that Web 2.0 trends and characteristics are changing the rules of the 'create and capture value' game, and thus significantly disrupt the effectiveness of established Internet business models*." (Wirtz et al. 2010 page 272). In relation to that the 4 Cs of the internet business based on Wirtz describe the main business models, i.e. Content, Commerce, Context and Connection. (Wirtz & Lihotzky 2003: page 525). The four models are extended with four factors with basic activities from the web 2.0 actual implementation. Table 1 is taken from (Wirtz et al. 2010 page 285) to illustrate the influencing weights from the existing business models. For this analysis the selection of the relevant business model is essential for the further work.

Business model	Social networking	Interaction orientation	User-added value	Customization/ personalization
Content	++	+	++	+
Commerce	−	++	o	+
Context	+	−	o	+
Connection	++	+	o	+

++: very high relevance; +: high relevance; o: medium relevance; −: low relevance.

Table 1. Web 2.0 Influences on business models, see (Wirtz et al. 2010: page 285)

The business model for mobile commerce and location based services is the next grade of details given. A framework for mobile commerce, as it is shown in figure 6, see (Varshney & Vetter (2002) page186), is the base for many players in the value net. With the framework one can identify the different possibilities to create value in the network, e.g. define the company position in the best combination of the 3 dimension user, provider or infrastructure. It is used for the description of the value net in chapter 3 as well. Several use cases and business scenarios are given by (Varshney & Vetter 2002: page 190) including a proactive service management for

vehicles with many benefits described for user, dealer and repair workshops, OEMs and even governmental offices.

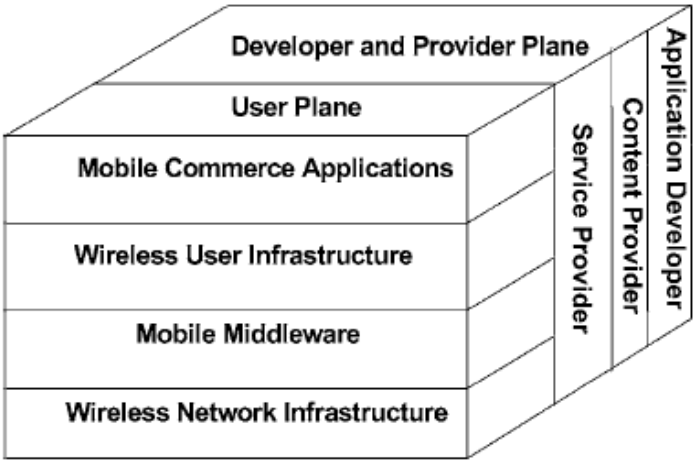

Figure 6. m-commerce framework, see (Varshney & Vetter 2002: page 186)

This concept is further detailed by Varshney in (Varshney 2003: page 244) including the location information for m-commerce applications and business models. This leads to the so called LBS location based services as an overall term for such user scenarios. Based on Ovum in (Green et al. 2000: page 39) referenced and further developed in (Lehner 2005: page 5) the main players in the m-commerce ecosystem are device manufacturer, network infrastructure operator, content provider, wireless service provider, other service provider, e.g. customization, application developers, financial service provider, equipment and infrastructure vendors and finally standardization groups and governmental authorities as shown in figure 7.

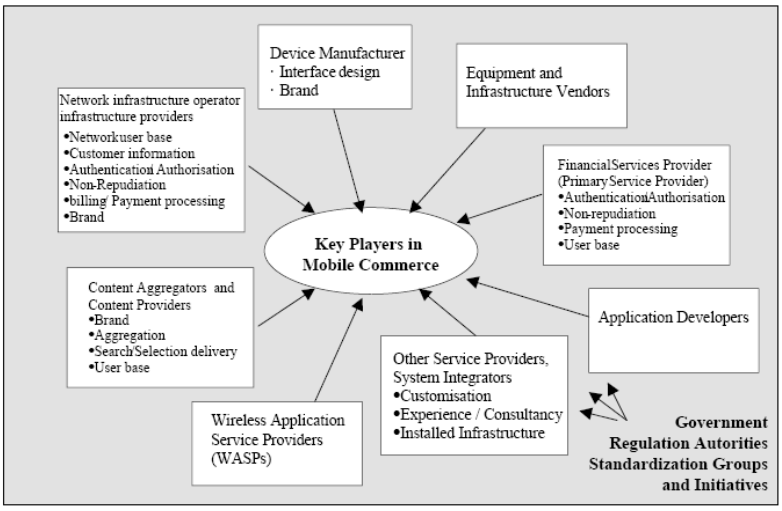

Figure 7. mobile commerce (Lehner 2005: page 5)

2.3.4 Open Source Business Model

With the increasing market share of the Linux operating system the open source issue became more and more known and relevant for businesses. Prominent examples are companies like Red Hat, MySQL that proof the profitability of an open source business model. "*Open Source can be considered a radical innovation in the way software is produced and distributed and is potentially disruptive of competitive equilibra in the software industry*." (Bonaccorsi et al. 2006: page 1086).

There are three different dimensions related to this subject, i.e. intellectual property rights IPR, community and the revenue sources in the open source business model. Legal components are mainly the IPR subjects, e.g. copyrights, patents, trademarks. The copyright controls the reproduction, development derivative work products and the distribution to the public, e.g. sale and rent of a product. Beside music, literature and pictures software is covered by the copyrights as well. In 1980, the US Congress passed the computer software act, an enhancement to the Copyright Act which granted copyright protection to the expression of computer programs, see Emerson in (Emerson 2009: page 593). The copyright protection does not prevent someone else to reengineer a similar program therefore a patent protection is needed. Actual discussion on the patentability of software and algorithms is going to extend the protection of software and might be a thread for the open source community. Many different licensing models are available and it became a critical issue for companies to choose the right one, depending on the underlying business

model. An overview is shown in table 2. with the possible usage and redistribution requirements for the developed software components.

Software license	Available at no cost	Distribution allowed	No usage restrictions	Source code freely available	Source code modification allowed	Derived work must be free again	Linking with proprietary software allowed
Public Domain	X	X	X	X	X		X
Shareware	(X)1	X					
Freeware	X	X	X				
GPL	X	X	X	X	X	X	
LGPL	X	X	X	X	X	X	X
MPL	X	X	X	X	X	X	X
BSD-License	X	X	X	X	X		X

1) Shareware is gratis for a trial period only

Table 2. Overview Licensing Models, see (Spiller & Wichmann 2002: page 16)

What is FLOSS Free/Libre Open Source Software? Free software Open source software means that the source code, i.e. written program, is accessible and be reused under certain licensing conditions. And free software does not mean without any additional costs, i.e. costs for integration, training, maintenance and distribution. It is evident that the technical benefits of OSS (e.g. quality, flexibility, security) are perceived to outweigh the technical drawbacks (e.g. concerns with documentation, expertise), and that the business benefits (e.g. encouraging innovation/collaboration and escaping vendor lock-in) make OSS a very attractive option for businesses. (Morgan & Finnegan 2010: page 91)

One important consideration when evaluating ones approach to open source is the business model behind the open source projects a company may consider. An overview is given in figure 8, given by (Koenig 2004: page 2). In figure 8 the license based possibilities are just a few among others and there are more choices for Continental and its AutoLinQ™.

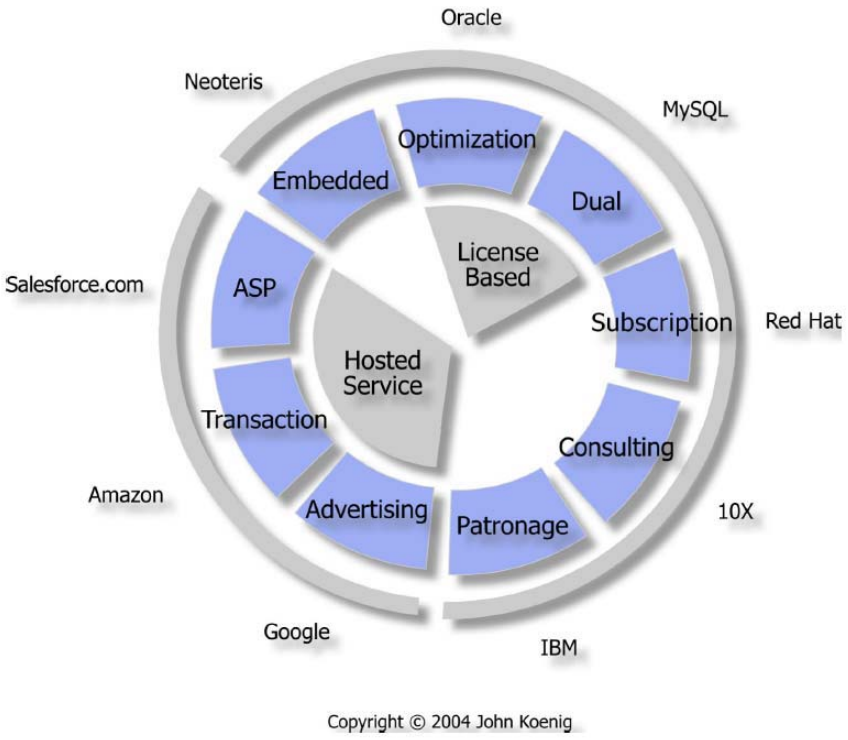

Figure 8. Open Source Strategies, see (Koenig 2004: page 2)

One major parameter for a traditional software company is according to (Bonaccorsi et al. 2006: page 1087) are the switching costs for existing products and related to the experience with proprietary software. Additional the changes in the organization towards the open source community are another important step for a company and more support is needed for the larger user network, see (Bonaccorsi et al. 2006: page 1087). Participation of the internal development group in the product development work for end user products is not mandatory but it makes the understanding of requirements of the community much easier.

If a company wants to enter an existing market with dominant players one possibility is to offer an open source product. Another reason using the open source business model is to establish a commodity product and earn money with related product, e.g. one example is the razor and razor blade combined business model, i.e. the razor is for free only the razor blades are sold. A company can release only parts of its technical knowhow with an open source license and some key technologies are still proprietary. An additional motivation for a company to use an open source approach

can be the fact that the increased market gives higher earnings than the share that is going to the competition, see (West 2008: page 86).

"Commons-based peer production" is the major principle of open source development projects and means that a group of individuals and organizations work together and provide the good to the public. (Piller et al. 2007: page 93)

2.3.5 AutoLinQ™ Applications

The main feature of AutoLinQ™ is to provide an internet connection within the car and to use similar applications in the infotainment system as the user knows from the PC and smart phone. Additional online services are available as well, e.g. online calendar, address book and email. Using a media center in the network enables not only the information download into the vehicles communication center it is possible to access existing vehicle data from anywhere the user has a connection to the network, i.e. from a PC or a smart phone. The end customer can retrieve information regarding battery voltage, available fuel tank from the car on the phone. With dedicated applications it is possible to lock the car or close the roof of a convertible car just by pressing a button on the phone. The same applications can run on the smart phone and on the board computer of the car, with the option to further customize the user interface in the vehicle. Not only new cars will benefit from the system the provision of an aftermarket product will upgrade existing vehicles as well. The AutoLinQ™ concept provides four different usage scenarios. Logically the first one is the in car usage called "car view". The connection is the important feature here to get ones emails, e.g. read by the system or simply enable location based networking. In supporting the driving task the system can guide the car to the cheapest gas station or remotely check the status of the car and call the workstation if needed. All existing navigation functions are accessible in this mode as well, i.e. guidance, get traffic and weather information. In the second scenario the car is parked and the user is on his way. Once again the remote operation of the car is an important feature, e.g. lock or open the doors. Retrieve the car status including the position or location of the car which is very beneficial if more than one person is using the car during the day. The third usage scenario is at home when the car is parked. Beside the vehicle status information can handle the personalized configuration and application download using a superior user interface on a PC. Finally the fourth view is the partner view for all members in the AutoLinQ™

ecosystem, i.e. providing an application store, the application certification and developing new applications using so far unused vehicle data.
One year later one of the intended products was explicitly mentioned in the annual report. (Continental 2010: page 35).
The CVIS study (RACC Automobile Club 2007: page 121) collected data on the usefulness and the willingness to pay for some services like area routing, cooperative traveler assistance, map update, obstacle warning, road status report and urban parking zones with the highest percentages. The data is available for selected countries in Europe and can be used as first selection criteria for profitable applications.

Evaluating software products is important for any mobile application as well. One possible approach is used in (Kittlaus 2009: page 55) using an adopted Boston Consulting Group growth-share matrix (Kotler & Armstrong 2008: page 40) where the market growth rate corresponded to the probability of success and the relative market share to the expected profit. In this case it is even more difficult to estimate the future development of certain applications in the market because it is a highly innovative and emerging business. The four categories, i.e. "Star", "Question Mark", "Cash Cow" and "Dog", are renamed into "Bread and Butter", "Pearls", "White Elephants" and "Oysters"
With the available data from participating companies in the ecosystem and from outside the automotive industry the selection of strategic partners can be performed in a concise way based on objective decision criteria’s.

3. Concept Development

In this chapter a concept is developed including the industry analysis based on the methods described in chapter 2, e.g. value net and five forces analysis. The business model is derived from the available literature for the developing market in which AutoLinQ™ will have to fulfill the customer needs. Beginning with the market size and its development over the next years the analysis is extended to all activities relevant within the value net. The identified hot spot where the main value creation is performed is the base for the five forces analysis of the selected node with the focus on the relevance for a tier one supplier. The results are later on used in the business model definition. In addition the influence of the open source approach is elaborated to identify the disruptive technologies and to prepare the selection of the principal operating system and smart phone platform and the related licensing model. With the focus on the distinguishing applications the focus is laid on the usage of data provided by the cars ECU´s and transmitted on the communication bus including all diagnostic data. In the next step the concept of Continental´s AutoLinQ™ is described to provide a base for the comparison of the theoretical and actual realized.

3.1 Concept Definition

In this chapter a general approach is shown and used as a base for the comparison of the AutoLinQ™ business case from Continental. First the market segmentation is elaborated and it is used as an input for the industry analysis as a starting point. The market size is estimated based on available figures and literature.

The next step is description of the activities performed in the value net and the relations connecting supporting and value creating nodes. In this analysis the value net definition is done before the five forces analysis is performed for the selected node in the value system, this is according to the recommended approach in (Besanko et al. 2007: page 313). The key node or key nodes are identified and used as the central point in the five forces analysis following. The influencing factors further detailed are used later on in the business model development. The selection of the open source licensing model is further detailed here. Finally the applications and white data services are described in detail to rank the potential apps to be developed with the highest potential for market development.

3.1.1 Market Definition

As laid out in chapter 2.3.3. with the basic definition of the market beginning with the end user who wants to use the internet and related web 2.0 applications in the car several different devices can be used. All consumer applications based on smart phones, PND´s, build in car electronics, e.g. navigation, telematics and infotainment products, have to be considered as part of the market. Some niche products like diagnostic connectors with wireless interface can provide similar data to the end user. PND´s with GPRS connection are providing a comparable infrastructure including a wireless connection to share additional information. The development of new car radio products without a mechanical CD drive will use an internet connection as well and provide internet radio as their main service.

The market size can be identified by combining the automotive market and the mobile phone market. With the market penetration of mobile phones in most of the markets with sometimes more than 100% a further distinction has to be introduced and only smart phones with at least GPS, G3 connectivity and WLAN should be considered. In addition to that PNDs and build in navigation devices can deliver a similar functionality to the end user. In table 3. an overview of different market segments is shown. For the automotive part the aftermarket business is important for two reasons. First the larger number of vehicles running on the roads gives a ten times larger market as the newly sold vehicles and second an aftermarket solution is not limited to the introduction plans from the OEMs for new car lines, i.e. a shorter time to market as usual within the telecommunication industry is only achievable with the aftermarket segment. Furthermore the regional segmentation allows the mapping of regional smart phone usage with the strong OEM brands in the three main markets and the BRIC countries. The revenues from apps download and the expected growth rate of this market is as well depending on the regional markets. The different products bringing the internet into the car have different cost structure, i.e. fixed versus variable costs and R&D costs for new applications. The adoption of newest technology in the telecommunication industry is not the same for different user groups, i.e. age, social milieus (Sinus 2010: page 1), and this is not the same distribution as in the automotive industry and therefore a merging of the two customer segments is needed as well to determine the possible market size.
The key driver for the app distribution will be the number of sold smart phones and this will stay a developing market over the next years.

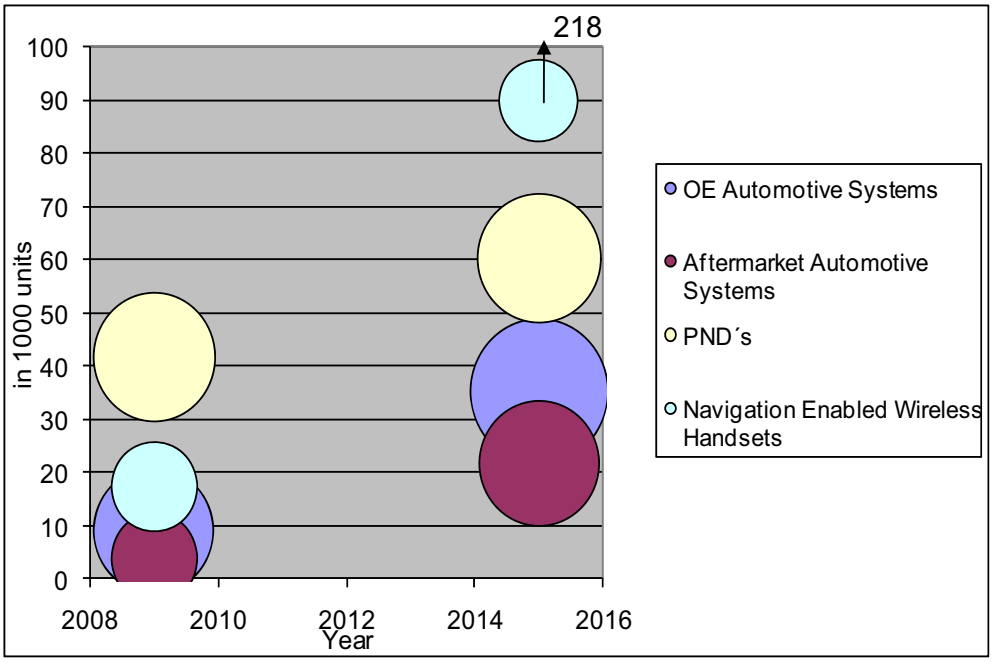

Figure 9.Market size for navigation devices (Blight 2010: page 2)]

The smart phone quantities were below 148 million units in 2008 and will exceed the 440 million units barrier in 2014 (Feick 2010: page 1) another study to be considered is the quantity shown in the study of (Pettey & Tudor 2010: page 1) with 875 million handsets in 2014. For the further investigations the quantities are more relevant for the App developers and service providers. The sales created by selling all the equipment is not in the focus here.

The next step is to further split the market figures into the regional automotive markets, to use the development of operating systems together with the app store and developer community to distinguish the different market increase.

See table 3. for the detailed market segmentation with the most interesting segments highlighted in red. Derived from the overview and the expected revenue per segment the most interesting one is the smart phone followed by build in navigation devices for the direct OEM business. The aftermarket solution should focus on the smart phone in the first step as well and use PNDs as the second choice. Detailed revenue numbers are part of the existing market reports from Strategy Analytics report, see (Blight 2010: page 2), the data for 2009 and 2014 is shown in figure 9. The quantities are on the vertical axes and the size of the circles indicates the potential revenues for each product category. Similar quantities are forecasted by iSupply, see (Kim 2009: page 1).

The next step in the five forces analysis is to describe in more depth the five influencing forces beginning with

In addition to the applications indented for the end customer directly several other features will bring additional services to the car user, both driver and passengers. These functions will enable other companies to offer additional services on top, e.g. insurance paid upon driven kilometers. The regional segmentation of the market is important as well because the global automotive industry in the upstream is localized in the downstream side of the value system and therefore the customer is used to a local dealer and repair shop serving the regional needs. In the telecommunication industry a similar structure is recognizable with a few global companies in the upstream and many localized offers by the network operators for the end user. In both well established industries there are still some new entrances visible, e.g. Acer in the smart phone market or HP in the operating system market by acquiring WebOS from Palm. In the automotive industry with the Chinese OEMs on the one side and the new electric vehicles developed and produced by e.g. Tesla on the other side change the market structure significantly. "*Major software companies such as Apple and Google, are disturbing the relatively safe and established actors of the mobile application business*." (Holzer & Ondrus 2009: Page 55)

3.1.2 Market Size and Development

See table 3. in the previous chapter for an analysis of market segments and the expected units to be sold. Based on the t the future development is important for the selection for the further analysis.

The revenues forecasted by various consulting firms are steadily increasing over the next years. The number of apps download will be 21,6 billion in 2013 from 2,5 billion in 2009. The revenue in 2009 was 4,2 billion USD with 99,4% market share for Apple, see (Pettey & Stevens 2010a: page 1), and it should be 29,5 billion USD in 2013. The market share will change due to more players in the market that are able to sell apps and not only offer free downloads which will still be 87% of all downloaded apps in 2013.

market segementation			products and services															
	2014		Navis PND				smart phones				buildin Navi				cdless radio/internet radio			
			US	EU	Asia	BRIC	US	EU	Asia	BRIC	US	EU	Asia	BRIC	US	EU	Asia	BRIC
	Mio units		25,59	20,48	5,231	6,358	79,95	78,00	17,55	18,47	13,8	16,9	9,3	6,1	5,4	5,5	3,6	3,7
B2B	OEM, insurance taxi fleet management telematic services																	
B2C	aftermarket automotive																	
B2C	advertisements	25%																
C2C	communities social netwoks developer community individualizatio n																	
C2B	data provider																	
C2G	data provider																	

Table 3. Market Segmentation based on (Blight 2010 page 9 to page 13)

In table 3 the main factors for the market segmentation are listed. Beside the product category used for the internet usage in the vehicle can be subdivided into the geographical markets, i.e. Europe, Nafta, Japan and BRIC countries. Beside the adoption of certain technologies and innovative products the distinction is important for the total number of products sold. On the other side the kind of market and the related applications are important, e.g. from B2C to C2G all possible combinations are possible. Examples of applications representing the market are listed as well to give a first insight of the expected usage scenarios. Differentiate between B2C and B2B markets, i.e. on the one hand private car user and on the other hand taxi, fleet, special purpose vehicles, e.g. police car or civil service vehicle.

The evaluation and ranking of the revenues of certain market segments in the different regions and enabling product groups is given in table 3. From today's figures the development until 2014 will lead clearly to the smart phone as the major product enabling the services build upon. The absolute number differs depending on the considered sources of market studies but nevertheless all come to the same leading product group. Based on the smart phone business the next question is what operating system will dominate this product group and which related ecosystem can generate the largest market acceptance. This will be one of the criteria for the decision which ecosystem to choose. Characteristics of successful brands includes according (Kittlaus 2009: page 99) the company specific competences, the strength to develop an ecosystem and technological leadership. Furthermore as described by Christensen in (Christensen et al. 2004: page 6) one way to create disruptive innovations is to target for non user groups, e.g. car user and car owner is a one to n relationship -> access to car user and not only to car owner or passengers opens up new market potential, e.g. car sharing with new applications.

Beside the different product that enable the internet usage in the car different connecting technologies are available, e.g. WLAN, GPRS, UMTS, Bluetooth. Many of these basic wireless connections bring different consequences for the business model, i.e. revenue stream and customer connection. In some of the market analysis the base technology is the main differentiator for the market development and size estimation.

Beside the new cars sold the huge numbers of cars in the market give the aftermarket business an important weight as well especially when beside the car owner other customer groups are covered as well.

Examples for the products competing in this market are PND´s with GPRS connection to provide so called live services, e.g. traffic news, road construction work. One example is the HD traffic from TomTom see (TomTom 2010: page 1) with a subscription based service. The subscription is between 5 to 10 Euro per month after a first free trial period. An overview of different products is given in (Barczok 2010: page 132).

3.1.3 Value Net

According to the value net analysis used by (Parolini 1999: page 90) the activities are subdivided into realization and supporting actions. In our example the realization activities are those directly related to physical product flow, i.e. production of vehicle components, vehicle manufacturing, car distribution, the selling or buying act depending on the view and the car usage of course. Several levels of details can be developed to describe all relevant actions but the model should still be useful for the main analysis task. The practicality of using more than 50 activity links and nodes is questionable because the identification of the hotspot for the value creation should be possible with a medium level model as well. A first high level overview of the value net is shown in figure 10. With identified areas of key players in the industry. The classical automotive value chain is in the upper half of the drawing from left to right with tier one supplier in most left followed by the OEM area. Further on the right the distribution and dealer have the direct link to the end user through the selling activity which is actually not the case for the OEM. In the lower half of figure 10 the smart phone value network is shown with the OS system provider delivering to the developer community and to device manufacturers. In the middle lower part of the drawing the distribution for download of applications for smart phones is concentrated and finally the mobile service provider and telecom companies are providing the connectivity for the end user. The link back from the end user into the value net is via data provision either to the social network or any other company using the data.

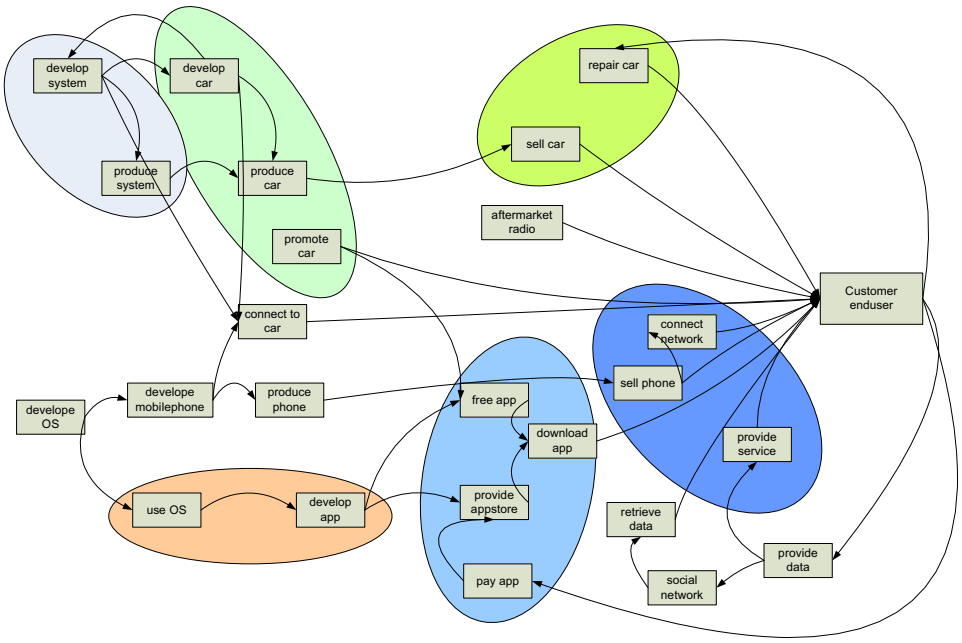

Figure 10. Value Net, following (Parolini 1999: page 71)

The OEMs are not any more the leader of the classical automotive value chain, see (Hüttenrauch & Baum 2008: page 213), who see system developer with the key knowhow as the main decision maker with increasing influence in the value net. The innovations within the network have to be focused on the end user because without understanding and customer acceptance innovations will not generate any additional value. According to (Hüttenrauch & Baum 2008: page 284) a clear business model is required and a single company can follow different approaches but it has to provide the appropriate structure and competences.
It is nothing new for the automotive industry to work with different service sectors, e.g. R&D, IT or financial service provider, especially the OEMs work close together with logistics service providers, see (Cammarata et al. 2006: page 7). Finally the distribution and dealership is another area including the maintenance and repair services used by the end customer. One challenge for the OEMs is to synchronize the different innovation cycles in the two industries, i.e. automotive and high-tech communication. The already high number of variants and possible customer configurations of a single car and the whole car lines of a single OEM will be multiplied with the increasing number of smart phones, PND and aftermarket devices used within the car. As stated in (Deloitte 2009: page 11 and 12) the OEMs have fewer competences in selecting or betting to choose the right components and

it will be essential for OEMs to work with players in high tech to combine their expertise and develop the features customers are willing to pay for.
Some of the companies acting in this value net are shown in the following figure 11. This illustrates some of the existing partnerships listed in annex in table 4.

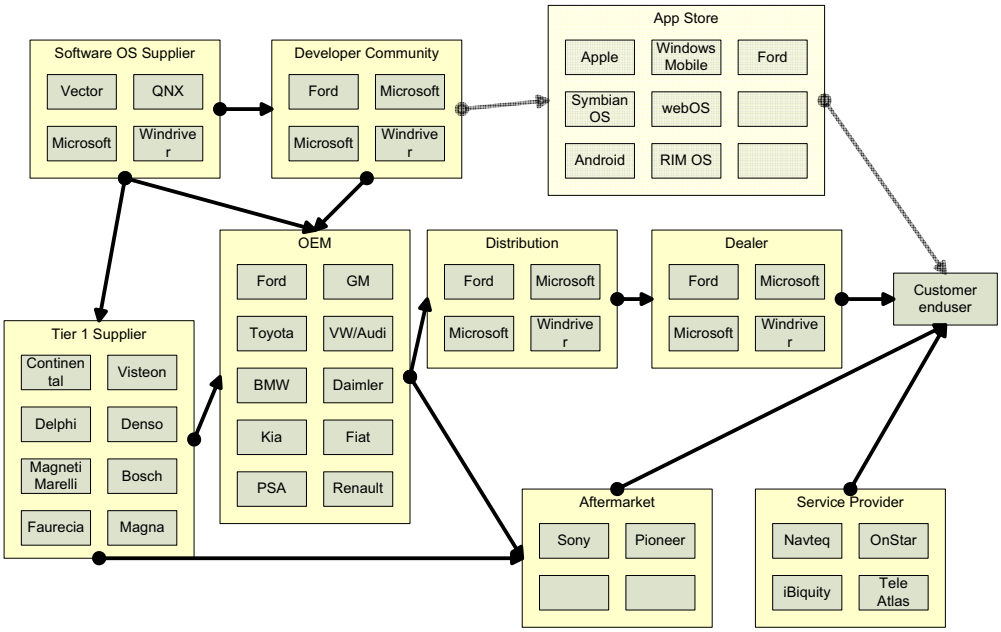

Figure 11. Value Net Automotive Industry

The list in table 4 in the annex gives an overview of the actual status of announced partnerships and existing relations between OEMs and tier one supplier. Some of the OEM's follow a proprietary solution without any possibilities for third party developers to contribute and others have closed solutions based on a standard platform, e.g. Microsoft automotive software platform, to be able to outsource to third party software development companies as well. The Genivi group follows the concept to define mainly the multimedia application for the car infotainment and connectivity features using an open source operating system, i.e. Linux based MeeGo. At the moment no OEM uses a complete open approach based on an open source business model.
In figure 12 the next step in detailing the value net is shown. Using the categorization of different levels of supporting activities a clear distinction is presented. Some of the companies might focus on the value creation area where goods are produced and physically handled where others might focus on the supporting actions, e.g. development. The end user is here replaced by his activity,

i.e. enhanced driving is getting well informed, e.g. infotainment, vehicle status data and route information, from point A to point B. Other customer activities are only supporting the key task, i.e. trip planning and retrieval of car status. The data generated while driving is another supporting activity that leads to improved navigation and infotainment services, e.g. LBS.

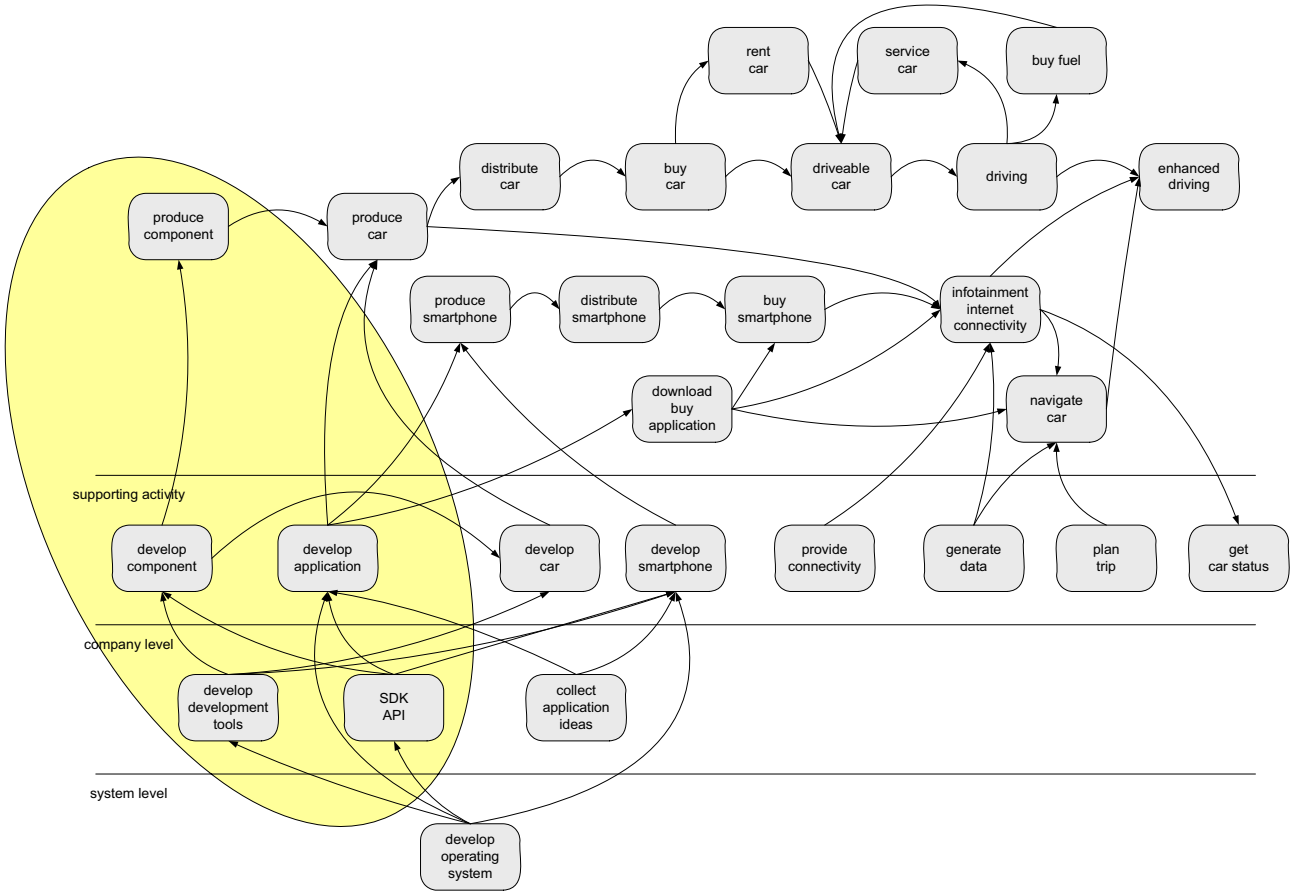

Figure 12. Value Net Automotive Industry

Not shown in the figure 12 are any other professional users of the vehicle or road data, e.g. insurance companies, service and repair workshops or governmental organizations, for reasons to keep the diagram simple.
The identified area where Continental can use its own strengths is shown in figure 12 as the colored area. This is showing exactly the contributions from Continental, i.e. produce automotive electronic equipment for the OEMs and develop these ECUs. The new activities are developing applications that can be used either on smart phones or on build in infotainment systems as well, provide development tools for the engineering community in an existing ecosystem, e.g. Google's Android

developer community, provide a SDK/API toolbox to connect to an ECU build into the car to provide the connectivity and vehicle data provisioning to a communication device, e.g. smart phone, home network.
For Continental it is important to follow constantly the future developments within the value net to be able to react on certain shifts of value creation. As mentioned in (Gueguen & Isckia 2009: Page 53) the borders of an ecosystem are unclear and many members of one, e.g. Google's Android, are member in another as well, they mention for instance that 76,67% of Symbian ecosystem members are members of a rival ecosystem, too. Mergers and Acquisitions are more likely to be seen in this emerging market, e.g. the takeover of Palm by HP enables HP to use the WEBOS operating system.
The forecast that advertisement and apps with advertisement will count for 25% of all downloaded applications in 2013, see (Pettey & Stevens 2010a: page 1), is another major part of the value network which is actually not shown in figure 12.
The actual node for the further analysis using the five forces from Porter is the one for Continental shown in figure 12, i.e. producing the connectivity ECU and the relevant SDK/API and applications.

3.1.4 Five Forces Analysis on selected Node in the Value Net

Based on the selected node in the value net in chapter 3.1.3. the five forces analysis is performed. The influencing factors are identified and related to different customer segments, i.e. B2B with the major automotive OEMs and B2C for the end user. The references are mainly taken from the smart phone including application market segment and the classical automotive industry structure from the view point of the tier one supplier. Developing a strategy in an emerging industry is characterized by a high degree of uncertainty about customer needs, technologies, services and product features. According to Porter in (Porter 1998: page 72) the productivity frontier is newly defined with higher growth potential for the leading companies compared to the existing imitations.

Internal Rivalry/ The intensity of competitive rivalry

First of all the rate of growth within this emerging market is and will be high over the next years as both industries, i.e. automotive and smart phone, show significant growth rates on a worldwide base. The switching costs for the customers are medium for OEMs for the B2B section and very low for the end customer who is

buying an app or a service. These costs will further decrease in future for the OEMs as well. This is mainly driven by the transparency of prices and conditions for the end users and the app provider can adapt the pricing very quickly because the software distribution has nearly no costs at all and only the R&D costs are relevant for the price calculation. In the case that the electronic is produced for the OEM the initial investment is moderate and most of the tier n suppliers delivering such products are already using similar production lines. The number of tier n suppliers is much higher compared to the number of potential B2B customer, i.e. OEMs, and this is another indication of an intense rivalry within this industry. The degree of competition will increase due to the forecasted reduction a consolidation of the automotive supply industry, see (Sturgeon et al. 2009 page 21) and chapter 2.1 with the external analysis. Any unique feature in the product and service provided by Continental is only a temporary advantage because similar products can be developed within a few months and brought to the market. The exit costs are low for the B2C sector and medium for the tier n supplier selling to the OEMs therefore this is a minor factor for the increasing the internal rivalry.
The smart phone industry is fairly competitive. Although there are few strong brands, the industry does not support many firms because there is limited ability to differentiate a smart phone from a competitor's except for interface. Customers care about buying a phone from the popular or reliable company, hence limiting existence of multiple small firms. Therefore, the smart phone industry supports multiple firms due to ability to differentiate between business and home users, but does not support a large number of smaller firms.

Substitutes and Complements/ The threat of substitute products or services
Focusing on the smart phone connected to the any electronic in the vehicle there are some combinations available that are substituting the Continental product offer. Some examples are PNDs with an internet connection and some vehicle data derived from the navigation signals, i.e. speed, direction, geographical location. The build in solution delivered by the OEM are priced significantly higher but guarantee a seamless integration in the OEM branded user interface and in car experience. Especially for the premium brands, e.g. BMW, Daimler, Audi, Lexus and Jaguar, the customer acceptance of a dedicated solution is given and the switch to a smart phone based product is less likely to happen. Customers using a PND might switch to the smart phone when they have to purchase a product replacement. Customers using existing services provided by various OEMs, e.g. Onstar or mbrace, might

stick to the branded product offer. Taking into account that any other hardware enabling the connectivity and apps used by the end user will increase the expenses of the end user as soon he owns a smart phone increases the pressure for the other solutions to compete in this market. Adding applications even approved ones by the OEM or Continental to an already owned smart phone is much easier and will have a significant price benefit for the customer. In future with further deployment of smart phones in the communications industry the number of potential users will increase and outnumber any other combined solution and foster the market position of smart phone based applications and services.

Entry/ The threat of the entry of new competitors

New entrants put pressure on prices especially if they come from other markets and can leverage existing capabilities. Many factors are indicating the attractiveness of this new developing industry, e.g. increasing market size, leverage of economy of scale. This is taking into account the aftermarket volumes on the one hand and the porting of apps to other smart phone platforms as well both extensions will increase the potential market with less investment. The branding is important for most of the automotive OEMs and some of the smart phone manufacturers, e.g. Apple, but for all other app developer or tier n supplier the brand recognition is not important and this will ease new entrance. For Continental the existing brand from the tire division could be used to establish the approval service of app for in car usage for different OEMs, leading to a Continental proved application trade mark. New players in this market will have different distribution channels with nearly instant access for the B2C applications via the existing app store infrastructure or a difficult channel for selling products to automotive OEMs. Here the incumbent tier n supplier will have a clear benefit over newly entering competitors. For all other issues, e.g. access to raw material, know-how or technology, the entrants will have only low barriers. There are some patents issued for connected services but not only from the automotive companies. And the related startup costs are very low for anyone developing applications for smart phones. If a company is starting to produce the developed hardware installed in a vehicles it has a medium investment that could be reduced by subcontracting a manufacturing service company. The assets needed are low as well because even the invested production equipment can easily be used for assembling any other ECU. As a conclusion it is very attractive to enter this market especially for the application development and service provisioning and to

some extend for the development and production of the connectivity hardware component, too.
The traditional component supplier or other companies, which are new in the sector, will take over these new value adding activities. Also, new entrants (specialized suppliers) are expected to appear on the scene. The result will be that the R&D and the value added activities will shift to the component suppliers. (Cleff et al. 2005: page 140). There is almost no scalability to create more software, so this does not force the market toward a small number of firms.

Buyer Power/ The bargaining power of customers (buyers)
The buyer's industry is far more concentrated, e.g. compare less than 20 OEM'S to several thousand tier n supplier in the automotive industry and in the smart phone application market the limited number of app stores. In the other B2B area for the application development this is true as well but with some regional differences because some companies, e.g. repair workshop, insurance, perform their business in a dedicated region and only a few of them are acting on a global scope, e.g. content provider. Most of the B2B contracts have a large sales volume compared to the B2C sales of application and services. For the classical tier n supplier the revenues are only a small fraction of their traditional business. This is different for companies developing apps and content because winning one OEM as a customer will definitely contribute a larger part to the company sales volume and therefore in this case the customer has the higher bargaining power. The specific investment made buy tier n suppliers for certain OEM products or smart phone platforms is moderate because only the needed knowhow for specific CAN interface or operating system features has to be build up. The threat of backward integration from the buyer side is low for the hardware development and production, because the OEMs are used to outsource infotainment systems and related components. The app development and service provisioning might be performed by the OEMs and other players in the automotive industry, e.g. car rental companies, with the goal to foster the customer relationship with the end user of a car or mobility service. The price negotiations between buyer and seller are done for each single transaction in the B2B market, i.e. for every new carline or face lift. This gives the buyer a chance to renegotiate a contract or switch to another supplier offering a better price, product or service. For the B2C application market it is completely different, i.e. a price is posted in the app store and not negotiated. Actually the portion for this electronic

equipment of the purchase volume of an OEM is medium and therefore the focus on negotiating will be comparable to other infotainment components.

Supplier Power/ The bargaining power of suppliers

The concentration of the supplier industry is clearly higher for the operating systems selected, e.g. applying the 80 20 rule only four products are available, and for the development tools needed. All the other electronic components are mainly commodities and even the several key parts, i.e. microcontroller or dedicated communication circuits are available from several different suppliers. These components are used in other products as well and therefore the bargaining power from the supplier is quite low. There are only a few substitute products available and a significant effort is necessary to change the component or operating system after the initial purchase decision because some specific investment in related tools, know-how build up and engineering effort was already spend. The threat of forward integration is quite low for the hardware components. Smart phones are not a necessary product, hence there is elastic demand for them and therefore the bargaining power is reduced. The steadily growing market for the coming years on the other side will create an increasing demand of components and for key components, e.g. microcontroller or for connectivity, the suppliers are in a good position for negotiations.

Derived from the five forces the business model can be defined and outline the strategy of a company to gain profit in this industry. The recommendation is to find a position in the industry where forces have less influence in reducing revenue and EBIT for a company. Within a changing or emerging industry some players can change their position to increase their value adding contribution. A company can actively focus on changing the industry with innovative products and solutions that offer a better value for the buyers. If the investment in the new technology enabling this emerging market is too high another strategy is to focus on cost reduction and follow the first companies in the market and sell similar products and services at lower price points.

If a company follows the strategy to differentiate by product innovations according to Cleff these innovations have to be financed with an increased efficiency along the value chain which includes component suppliers as well as after-sales services, see (Cleff et al. 2005: page 140). According to Roch the value flows not from technological innovation but rather from the “value innovation” that unlocks new

demand by radically increasing the appeal of a good or service. (Roch 2006: page 10) and further on he mentions that noncustomers uncover new elements of value that can be introduced into a business's new value curve. (Roch 2006: page 39). One other critical issue mentioned by Fejioo in (Feijoo et al. 2009: page 283) is that finding customer groups with common denominators large enough for a profitable exploitation. One approach can be that service providers make two versions of a service to serve multiple segments and the value-creating elements of personalization and context awareness for the end-user have to be evaluated.

The implications of these developments are impacting the automotive industry when the need for software updates is taken into account. This leads to OEMs that are taking on the role of becoming their own tier ones – a function first defined by Ford with the launch of Sync. Ford has pioneered the strategy of acting as general contractor for its Ford Sync system with its growing community of software developers and service providers.

3.1.5 Business Model

The goal is to develop more business models and not to focus on one concept to early in the design phase. Future scenarios can include business as usual as one idea because then the different developments are more obvious and the new approach is easier to communicate with that reference. Additional other scenarios focusing on certain main business factors can be developed until a predefined level of details, i.e. the effort should be limited in the creation phase. Different customer views are a very good base for developing scenarios for the actual industry circumstances. Prototyping might get one step ahead in detailing the business models therefore the number of prototypes should be limited. In (Osterwalder & Pigneur 2010: page 165) the degree of details can vary from the so called napkin sketch to the recommended business canvas with only qualified data or to calculated business case including costs and potential revenues. A last step is to perform a field test and include a company's actual customer in the investigation. The collection of customer insights is important because in new markets it is not clear in the beginning what problems the customer wants to solve. Classical market research is not the appropriate tool in this respect and instead the customer view point is the turning point, i.e. view the business model through the customer's eyes, see (Osterwalder & Pigneur 2010: page 128). This is a similar approach as the value net analysis from (Parolini 1999: page 217) and in this point both concepts

enforce the customer view point as the only judge on value creation and customer benefit.

According to Osterwalder in (Osterwalder & Pigneur 2010: page 44) the setup of a business model could have the outline as shown in figure 13. with the same definition as outlined in chapter 2.3.3.

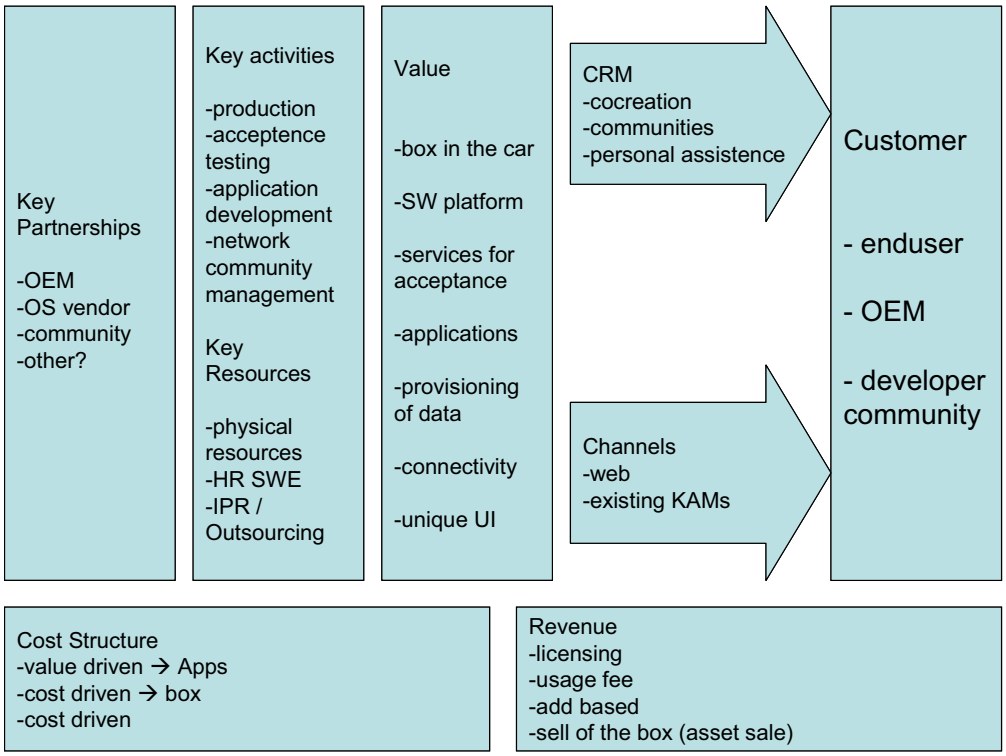

Figure 13. Business Model, based on (Osterwalder & Pigneur 2010: page 42)

The next step is to setup a prototype of the business model, i.e. select different combinations of patterns, e.g. unbundling, free, freemium or bait & hook. Unbundling in this case means to split this single business model into different models for the infrastructure management as shown in figure 15, product innovation as shown in figure 14 and customer relationship management, see (Osterwalder & Pigneur 2010: page 62), with OEM, end user and developer community as the main customer segments.

The free pattern is based mainly on add fees collected from various partners in the value net, e.g. OEMs, car dealer, car service center, gas stations or toll collecting firms. As described in (Soroa-Koury & Yang 2010: page 105), for many mobile users

and people around them, receiving mobile ads is not desirable, therefore social norms theory will better help determine consumers' responses to mobile advertising. The freemium pattern would offer free applications for the private or limited usage and paid services for professionals, e.g. fleet management or car rental companies, see (Osterwalder & Pigneur 2010: page 96). The bait & hook pattern would give away the needed installed box for free and sell a subscription for the service of data provisioning, e.g. like free mobile phones from telecom operators.

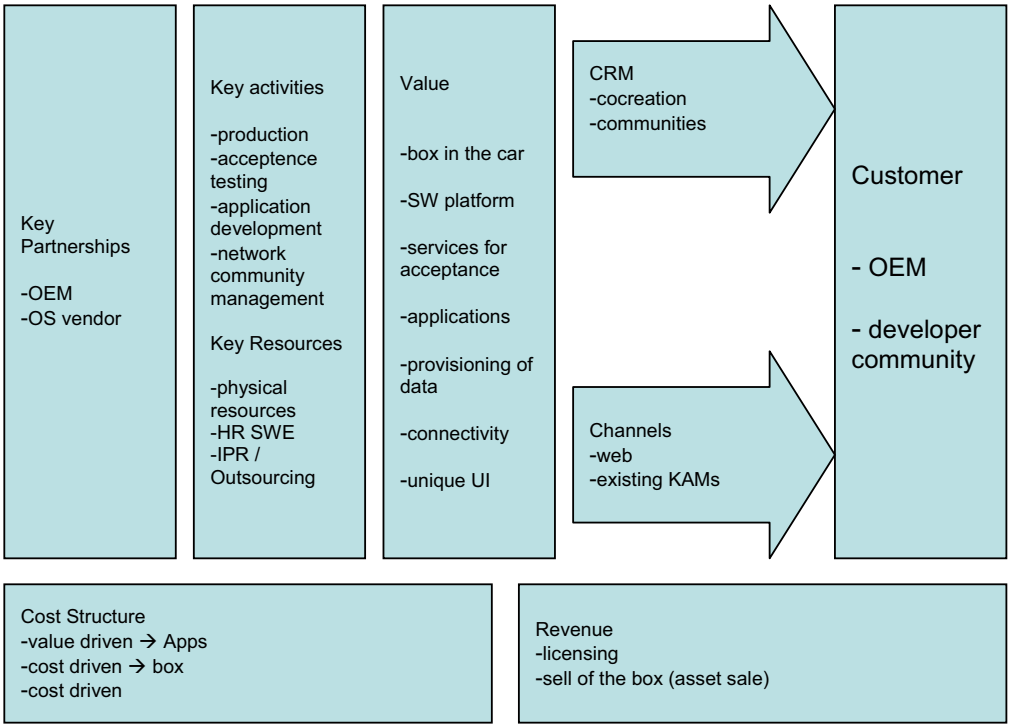

Figure 14. Business Model for Innovation Pattern

The definition level of details of each prototype is another important decision in this phase of analysis, i.e. from the high level concept from figure 13 down to detailed calculation of different revenues, cash flows and cost estimations. From today's starting point an extrapolation of the development up to five years in future is calculated. From the different scenarios a comparison using a formal SWOT analysis can be performed to collect further information.
Using the phase approach as discussed will support the whole process from the first business idea to the implementation of a business model.

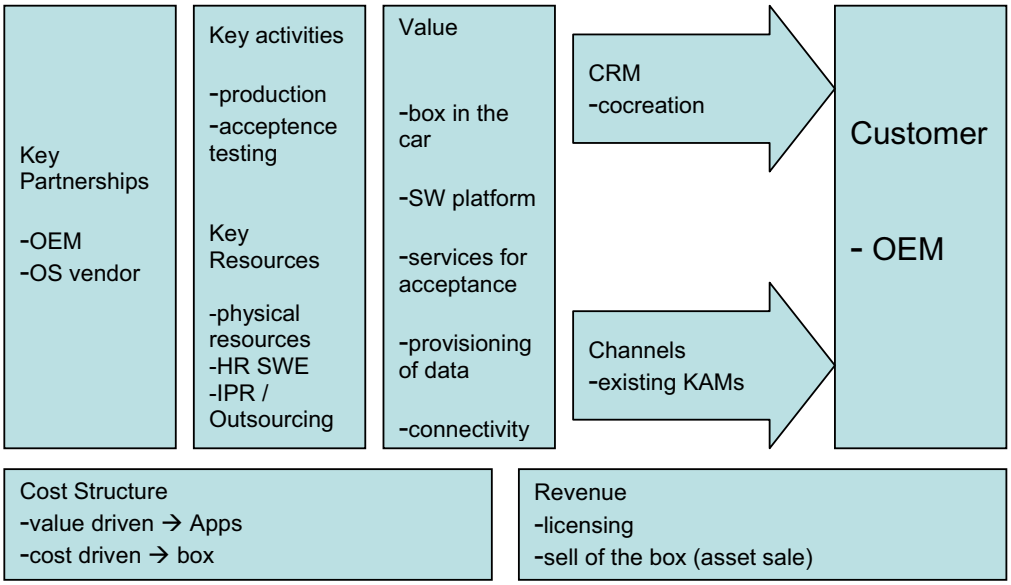

Figure 15. Business Model for Infrastructure Pattern

An overview of possible ways to generate revenues is given in (Feijoo et al. 2009: page 288) with major distinction of subscription based and advertisement based revenue models. Here subscription is a periodically charged price, e.g. mobile content, and it is often combined with community approach including free and premium services. The advertisement concept can be combined with the community as well. In addition to the pay per use model only charges for used services or connection time or network bandwidth are claimed.

For the further development of the business model the emergent strategy is recommended because flexible feedback using from the markets, used in uncertain environments. A company collects market signals and derives from the available information a discovery driven planning.

For large companies especially in the automotive industry it is important to decide on the internal organization for disruptive innovative product development. The thinking out of the box, i.e. traditional business concepts and markets, is requiring a different management approach. One examples is given by Daimler with its internal spinout organization developing new business ideas and bring them to newly developed markets, e.g. car2gether from Daimler in Germany, see (Schindler 2010: page 1).

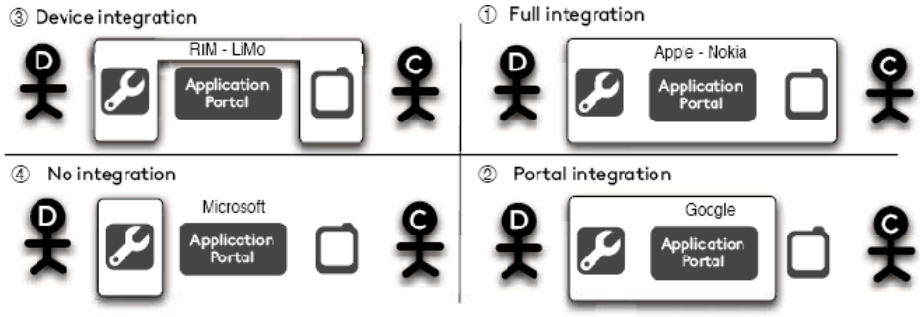

Figure 16. Various types of platform integration, see (Holzer & Ondrus 2009: page 59)

The existing models how operating system providers are controlling the distribution of applications for smart phones are shown in figure 16, see (Holzer & Ondrus 2009: page 59) for further detailed description. The portal integration is the one that offers on the one hand a managed portal for the distribution of applications and on the other hand enough freedom to select devices that are build into cars, e.g. navigation, infotainment, connectivity.
The value chain evolution theory means to control any activity or combination of activities that drive performance along the dimensions that matter most to customer.

The main strategic decisions on make or buy are based on two questions. A company should integrate activities to improve the fulfillment of customer expectations that are not good enough today. On the other side a company can outsource activities that are more than good enough solved for dedicated customers. On the timeline this is interpreted as tomorrows profits depend on the solution offered for tomorrow's hard and important customer problems, because the customers are only willing to pay for the problems that matter most to them.
And with the approach to standardize what can be outsourced leads to the adoption of an open source concept detailed in the next chapter.

Derived from the business model the focus is on the implication of using an open source licensing model for the API/SDK product and on the potential applications to develop the market using data available from the car and its communication interfaces, e.g. CAN bus, so called white data services.

3.1.6 Open Source

The expected profit estimations in value networks based on an open source strategy are highly different for various firms in the value net. (West 2008: page 86) Therefore the positioning within the value network is very important for companies to ensure ones influence and secure their part of value creation and earnings. In this case the selection of the licensing model together with the chosen operating system platform and related ecosystem is important for a tier one supplier. With the option of having several open source concepts the decision for only one ecosystem is limiting the potential market for the tier one supplier.

In (Simhandl 2007: page 101) the value add is analyzed, the main role is given to the mobile network service provider. Another success factor is the innovation capability through infrastructure, investment and regulation decisions. A complete list of value adding activities is given in (Simhandl 2007: page 104) including outsourcing to customer groups, e.g. for content provision and app development.
A generic business model is derived for location and context based services, including customer, network provider and toolkit provider. From the nine types of value collecting models in (Simhandl 2007: page 108) are community model, affiliate model and information intermediation relevant for the toolkit product.
A more efficient innovation process based on available toolkits a company can actually abandon its efforts to understand users' needs accurately and in detail, see (Hippel 2005: page 147).

Many open source license models require a patent free contribution. "*Contributions must be made on a patent and copyright royalty free basis*" (Yann 2009: page 7). In addition the patent non assertion policy is extended to all members including the distribution to non members. In a recent study the Gartner Group recommends that Google should coordinate patent agreements and infringement defense for the Android business ecosystem, due to their central role as a keystone player. (Prentice 2010: page 2)

Google entered the mobile software market by passing on Android to the Open Handset Alliance. Although the underlying Linux kernel is licensed under GPLv2, many parts of the application software infrastructure that make up the Open Handset Alliance's platform will be distributed under version 2 of the Apache

Software License ASL. ASL is a permissive license, i.e. code can be integrated into closed-source proprietary products. The redistribution can use various other license models and is not limited to the requirement to reuse the license model like in GPLv2. This and similar licensing models, e.g. BSD or MPL, are preferred by companies because the can easily add proprietary software components and sell the product without handing the software back to the open source community, see (Ryan 2010: page 1).

Advantages of open source software are cost reduction, reduced time to market, i.e. reduced development time, multiple sourcing is possible, but drawbacks are grant royalty free patent license. This risk can be covered by thoroughly selecting the licensing model. A new concept trying to solve the patent infringement problem is the defensive patent license DPL model.

More complications are introduced by the possibility of software patents, see (Göttling 2003: page 1), the holder of a software implemented patent can exclude third parties from any usage of the method or algorithm. But a patent is a blanket injunction against implementing a certain idea. It does not matter who writes the code or even what programming language is used. Once someone has accused a free software project infringing a patent, the project must either stop implementing that particular feature, or face an expensive and time consuming law suit. (Fogel 2009: page 172).

"*Individual developers often understand the nuances of various open source licenses, but they generally do not have the time or resources to follow copyright, trademark and patent law in detail*." (Fogel 2009: page 85).

An example is the mp3 data format where the encoding software is licensed the mp3 player software is accepted without any restrictions.

There are several actual law suits ongoing in regard to Android and its patent infringements. First the action taken by Oracle putting a lawsuit against Google for Java patent infringement highlights how Android is going to become a big target in court (Dignan 2010: page 1). Another patent infringement lawsuit was filed by Gemalto against Google, HTC, Motorola and Samsung for use of its Dalvik virtual machine and related development tools and products. (Marand 2010: page 1).

Microsoft has been eying a patent lawsuit against Taiwan-based companies Asus and Acer. The reasoning behind this is due to a number of patents that Microsoft believes are being infringed upon in regards to Android-based hardware. Just last month, Microsoft launched a lawsuit against Motorola's use of its patents in their Android Hardware. The report came in Taiwan's Commercial Times newspaper, and although Asustech is already denying it, Acer has yet to make any comment on the validity of the news. This is another in a long line of mobile phone operating system and hardware battles making their way through the courts at the moment. Already, Apple has targeted HTC in a move against Android, while Oracle has also stated that they were not happy with what they say was Java code found in the operating system. Microsoft had previously announced that it would be licensing their patent portfolio to HTC for use in their Android phones, thus avoiding lawsuits like these. Therefore the patent free provision of a SDK or toolkit is one requirement for the developer community. In this environment many patents are issued and it is important to proof what patents might infringe the AutoLinQTM SDK.

A quick patent search resulted in several patents describing similar methods, products and application of technologies comparable to the AutoLinQ^{TM} product and services. The patents can be grouped into different categories first they include a hardware box with a wireless communication interface and a wired connection to the vehicle communication bus build into the car, second a central internet server collects the data and third a simple gateway transfers the data from the vehicle to a wireless device. Nearly every solution described collects data from the vehicle, i.e. low level frames with data packets, OBD II messages or predefined textual readable messages shown on a display device. Only few patents include a remote control function of certain vehicle functions. The patents are filed by various assignees like General Motors, VW, Bosch, Denso or Lear from the automotive industry but some patents are filed by companies from the ICT industry, e.g. Microsoft, Lucent Technologies, Agere Systems Guardian or Cisco Technologies. The standard technologies used in several patents are available in smart phones today, e.g. Bluetooth, WLAN, GSM, GPRS, UMTS and GPS.
A list of relevant patents is shown in table 5.

The selection of the licensing model is important and according to (Hauge & Ziemer 2009: page 73) must enable to collect revenues either from the product or the related services, e.g. compatibility release testing, and a growing community. The

governing of a community is a challenge to encourage contributions and provide a certain quality level of the developed applications. Recommended by (Hauge & Ziemer 2009: page 79) is an active community to sustain the volunteers to be active and including the core development team in the community using a common infrastructure to share information and to coordinate all activities.

The main factors for open source innovation are motivated agents, reputation, reciprocity and utility or learning, see (Belenzon & Schankerman 2008: page 9) for detailed description. The entry barrier, i.e. cost of contribution, has to be low as well, e.g. well known programming language, common operating system with wider usage. The benefits for the contributors to an open source project may vary from learning effect to reputation gain from the community or potential employers.
The identification and motivation of community members that are qualified to contribute to the specific development task are the main factors see (Füller et al. 2006: page 68), and the fun-factor and intrinsic stimuli proved to be more important than monetary incentives.
The selection of the license model is important because on the one side it supports the number of contributions and on the other side enables commercial returns. In (Belenzon & Schankerman 2008: page 7) it is laid out that the number of projects with highly restrictive licensing, i.e. GPL, has the most contributions followed by less restrictive licenses, e.g. Apache License, BSD License, Lesser GPL or MIT License.

In (Simhandl 2007: page 74) an end user toolkit for mobile services is described. The requirements for toolkits are collected, i.e. flexible components are the base for new services, overfriendliness, easy to learn design process.
Location based services based on user toolkit designs can vary from passive information services to information retrieval or to active context related applications with automatically followed rules. In the automotive context the applications are driver assistance application, location based services for tourists or smart shopping applications, for more examples see (Simhandl 2007: page 82).

3.1.7 Applications and White Data Services

There are different possibilities to group potential applications used in this context. One is to define different views as the AutoLinQ^{TM} concept described in chapter 4.1.3 or a second approach is to group the potential customers into occasional, office driver, i.e. he drives daily from his home into the office and back, frequent

driver or commercial driver, e.g. taxi driver. This category can further be detailed into subgroups with different age or experience. The passenger is another group with special requirements.
Another way to group the apps is to analyze the used data and provided information, e.g. any data downloaded from the internet to the car or data collected in the car and transmitted to a server application.
The first question to be answered here is if the feature or implemented functionality is running in a browser or app based. Apps have advantage in map applications, navigation and gaming and opposite the browser are used for news retrieval, searching, weather download and social networking.

Many apps are already available in various app stores for the major smart phone products. The ranking is headed by Apple followed by Google's Android and all other platforms are lacking behind.
The most important top ten applications are listed by Gartner in (Pettey & Stevens 2010: page 1) with money transfer, location based services, mobile search, mobile browsing, mobile health monitoring, mobile payment, NFC services, advertisement, instant messaging and mobile music.

According to (De Reuver & Haaker 2009: page 240) an important type is location-based service that uses the current location of the user, including the popular in-car navigation services. Simple turn by turn navigation applications are available for free already and they will further change the business for build in navigation devices. Only extended route planning or the usage of additional information like real time traffic conditions or the possibility to plan a trip and make a reservation of a free parking spot can increase the customer benefit and the willingness to pay for navigation features. Some of the trip supporting navigation functions are extended by social networking and data sharing apps like a speed camera warning along the route, e.g. Trapster®, see (Trapster 2010: page 1) or RedAlert, see (RedAlert 2010: page 1). Both apps are available already for smart phones.
Combining vehicle data like fuel level and the route data can enables location based services like finding the cheapest fuel station along the route with an optimized calculation using extra distance and price difference.
Based on the route a congestion zone alert can be issued if the driver is entering a certain restricted city area for environmental reasons.

An app that is aware of the context, i.e. in addition to the geographical coordinates the personal mobile profile is used, can provide a better suited content to the end user, in (Feijoo et al. 2009: page 290) this concept is described as reality mining or augmented reality. One example of an augmented reality application on a smart phone used in a car is the Augmented Driving app for the iPhone by imaGinyze (Imaginyze 2010: page 1). It provides lane detection, distance measurement to the car in front just by using the build in camera and an in car mounting device. Additional information is displayed in a kind of HUD mode, e.g. vehicle speed, system frame rate. Additionally the system can be extended by reading traffic signs and display the actual speed limit or using available navigation data to provide speed warning depending on the road ahead. Another app could record the driving performance and compare it to a second try on a race track or on the daily way to the office. Finally a virtual co-pilot could improve driving performance depending on the recorded data and recognized driving situations.
For the augmented reality the available data from social networks, e.g. Facebook, Twitter, Xing, can be displayed on the navigation map as well.

Many applications just use the data provided via CAN communication to a vehicle internal gateway module that transmit the messages via a wireless connection to the smart phone. Nearly all information used by the OBD II standard is available but it has to be converted into a user readable format, e.g. engine RPM, engine coolant temperature, air temperature, vehicle speed, MIL light status, battery voltage, gear position, trip time and so forth. Additional vehicle data like tire pressure, number of occupants, parking distance, steering wheel angle, fuel level, light or rain condition has to be provided by dedicated sensors. Most of the times these sensors are evaluated by the body controller and the values are distributed via CAN. In addition any information provided by a car2car or car2infrastructure network can be displayed on the smart phone. Simple applications just display this information. More sophisticated ones like the AutoBot™ from Mavizon that is connected to the OBD II connector in the car and transmits the data via Bluetooth to iPhone app can take over control of certain car functions, e.g. door lock, horn or alarm.
One critical application is the use of the crash sensor combined with the emergency call function. Here once again the regulation by different governments will emphasize the use of this feature in the car.
In regard to safety functions some apps will support this as well as the need to improve eco friendly driving with less fuel consumption. Once again the combination

of vehicle data and route planning can record the ecological footprint of a trip and compare it within once social network, leading to a competition that can drive a certain route with least fuel.
The social network can be extended to include the vehicle and the possibility to offer a drive from point A to point B or any other point on the way in between, see car2gether from (Schindler 2010: page 1). Where people can offer or search for a drive within an urban area like Ulm or Aachen in Germany.
The car rental can become much easier by using apps on the smart phone enabling to select a rental anywhere in a town. The customer can leave the car at his destination point and is not forced to return it at certain car rental locations. Some companies like zipcar or car2go from Daimler, see (car2go 2010: page 1) are already available and use at the moment dedicated hardware components that could be replaced. Both concepts could impact the need of buying and owning a vehicle to be mobile. With the installed app on the smart phone the customer can search on a map the nearest location of an available vehicle and rent it online, approach the car and open it with the smart phone. Different pricing models depending on the time or day within a week, driving distance, accepted mobile advertisement in the car are possible and the payment can be performed via the smart phone, mobile service provider, credit card or a company account for renting the car.
Another example in Germany is the caribo service, see (Schindler 2009: page 1), which includes taxi companies too.

Another possible application is to combine the navigation and route planning data from the car with any other public transport, e.g. getting into a city by combined usage of vehicles can be more convenient for the customer if a detailed real time train schedule is linked to the linked to the navigation device, e.g. smart phone in the car the before mentioned reserved parking lot can further improve the daily trip into the office.

The SDK provided by VW for their app my ride contest, see (VW 2010: page 1), includes vehicle data, e.g. breaking pressure, current gear, lateral acceleration, wheel angle, engine output and engine speed. All values are updated frequently between 200 milliseconds and two seconds. Some of the apps are just fun applications or games for which the customer will not be willing to pay any price, e.g. number plate recognition plus quiz, note taking without pen or driving cost

calculation. Some ideas might be required in future by law, e.g. blood alcohol or reaction test, pre accident recorder similar to the black box in an airplane.

Another type of usage of the smart phone in the car is to make it part of the user interface of the build in infotainment system. The touchpad or the voice recognition can become a way to enter or select certain car functions. The seamless integration into the car infrastructure will require a similar app based user interface in the on board electronic devices, e.g. radio, climate control, board computer. The touch screen can enable a simple form of entering characters with a finger and reduce distraction of the driver.

Basic car functions like pressing the horn or lock unlock the doors or trunk are already available, e.g. zipcar app for iPhone, see (zipcar 2010: page 1) iPhone]

The research project ELMAR goes even one step further and enables the steering controlled by an iPhone, see (ELMAR 2010: page 1). An app provides the needed buttons for acceleration and breaking. Moving a finger from left to right switches on the flasher or up and down changes the actual gear accordingly. The driving direction is selected just by tilting the smart phone in the indented way. Another feature is the live view presented on the touch screen which is transmitted via WLAN from the vehicle on board camera system, especially in worse driving conditions with reduced visibility an infrared picture can increase the safety significantly.

One business application is to make the smart phone a taxi meter that is directly connected to a central server for tracking and invoicing the taxi fare.

Weather information can be send to the smart phone in the vehicle depending on the planned route including live rain radar pictures and thunderstorm warnings. In this category of tourist and travel applications belongs simple travel logging of GPS data, guides, e.g. Michelin guide for the iPhone, planned trip information.

Being away from the car the checking of the vehicle status might be one of the useful applications on the smart phone. To find the car where it was parked, e.g. in front of a mall or in a foreign city, is another app with an expected high usage ratio.

The online vehicle status is used in the home view scenarios as well. The theft prevention or car usage blocking is another possible feature. The remote heating and climate control can use prerecorded usage patterns or on demand control by the user of the smart phone.

Other applications need the contribution of the end user, i.e. driver or passenger, as described in (Feijoo et al. 2009: page 290), with three different types, i.e. directly created, added to pre-existing and indirectly created content. All the data provided by the car while driving a route is indirectly created because it is only a by-product. If the user provides data for the OEM, dealer, repair workshop or insurance company a personalized offer can be provided and the customer relationship management is well suited for individual needs, e.g. service alerts, scheduling and notifications will be offered based on information transmitted from the car, see (Rishi et al. 2008: page 11). The next step from provided data to receive dedicated offers is to accept advertisement based on general location data.
Advertisement as a business model for the mobile apps is very important, see (Bango 2010: page 1), with up to 80% of all app downloads for free the only major possibility to earn money is to sell advertisement provided with the application.
The acceptance of mobile advertisement is another important question to be solved in this context in (Soroa-Koury & Yang 2010: page 105) the ease and acceptance is investigated in the smart phone industry. Most experts' regard mobile advertising as a significant revenue source for mobile services, especially if advertising can be made ‘‘more focused, personalized and contextualized”. (De Reuver & Haaker 2009: page 246).
The complete market of mobile advertising will increase to 7.5 billion USD in 2012, see (Pettey & Stevens 2010: page 1).

The legal regulation regarding the usage of touch screen devices during driving will change and lead to more voice controlled applications in future. The future of released regulations can influence the acceptance of apps significantly and has to be considered by Continental in the AutoLinQ^{TM} business model. The usage of voice activated equipment might become mandatory for the driver therefore voice recognition and text to speech is a must for the apps, e.g. reading emails and sending messages.

Further examples of combined applications are announced by Navigon that the next version of its iPhone application will feature a Twitter and Facebook tie-in that allows users to broadcast their location, destination, and estimated time of arrival to friends and followers. Similar extension of navigation software will be introduced by ALK Technologies, Verizon Wireless, Nokia with its OVI Lifecasting, GyPSii.
The classical application is using the internal data from the vehicle CAN interface using the OBD II interface. In (Ghiani & Paternò 2007: page 301) an application is described on an older PDA device. It is already pointing in the direction of using OBD-based monitoring is very practical if a handheld computer is used: PDAs with touch screens can be quickly installed on board (those equipped with GPS are often used as portable navigators). In addition, recent PDAs have enough memory capacity and computing speed to properly manage Automatic Speech Recognition (ASR) and Text To Speech (TTS) processing.
BMW Group announced their support for “iPod Out” at this stage it is only displaying music lists in the dash board, but it is likely that Apple will extend this technology to controlling apps in the dashboard, see (Mohindru 2010: page 1), similar to the Terminal Mode technology from Nokia, see (Brakensiek 2010: page 2).

3.2 Continentals Concept

Based on the internal analysis described in chapter 2.2 and the functional description of AutoLinQ™ from chapter 2.3.5 the concept is further detailed. At the Automobil Elektronik Fachkongress Elektronik in June 2010 in Ludwigsburg Helmut Matschi, Board Member of Continental gave the strategic outlook for the next development steps of AutoLinQ™. The conventional value added chain in the vehicle will be modified in some respects. This means that the focus in future will be on across-the-board systems integration and services around the navigation core. External partnerships will be necessary to realize this vision. In line with this, AutoLinQ™ has been developed as holistic end-to-end concept, combined with system integration and the uncomplicated, secure Simplify your Drive user concept. The all-in-one AutoLinQ™ package contains HMI, system integration, connectivity, infrastructure, e.g. from our partner Deutsche Telekom, community management, an app store, app certification and customer service. The importance of HMI has increased significantly in the past 10 years. Increasing functionality causes higher operation complexity Innovative HMI concepts need to reduce this complexity! More and more, HMI becomes one of the most important USPs!

With all the available different solution it is clear that not a single company can control the smart phone interface to the car but it developed as a new battle ground for companies entering this new developing market. Continental's system integration expertise is a key differentiator. With our broad technology experience and existing product portfolio Continental is able to develop solutions that create differentiating value for our customers, e.g. OEMs. The Interior Division’s unique selling point, and the reason it holds its position in the market, is its focus on informing drivers and passengers better than our competition and connecting them all at lower cost.
The digital lifestyles we are leading today, combined with vehicle safety trends, will continue to transform in-vehicle electronic architectures and evolve the cars we drive into the most reliable high-tech electronics device we own. Many of the technologies and trends that are appearing in consumer culture will impact the content, services, features, and the interior design, of cars produced in the 2010–2015 timeframe.
Continental announced during the CeBIT 2010 the creation of a framework, providing the basic equipment package with the AutoLinQ™ marketplace, the company provides – in like manner as for modern cell phones – the platform on which third parties can quickly and easily make available their own applications employing Android. To this end Continental will be offering the developer community a software development kit and will team up with systems partners and vehicle manufacturers to ensure, via elaborate certification and strict design guidelines, reliable and smooth in-car operation.

3.2.1 Business Model

The business model presented by the Boston Consulting Group to Continental was based on the context of the so called "Webservices@car" that exists in various outlines for several years now. The main objective was to identify the superior value propositions and a sustainable operating model for Continental. Some of the major findings are that there is a need to distinguish between solutions for passenger cars and for commercial cars/fleets, the combination of vehicle data and the internet creates the value proposition, the time to enter this market is now for a tier one supplier like Continental. Derived from the identified mega trends, e.g. urbanization, ageing population, new communication technologies, on the one side and future mobility trends on the other side some new services are identified and their relevance for the internet enabled vehicle are listed, e.g. mapping, navigation, real time traffic information, routing and parking information is combined. An overview of

innovative solutions is given by the presentation including OEM and service provider products spread over the degree of innovation and mass market adoption. This is further detailed by an evaluation of existing offerings from OEMs, telematic service provider and mobile device manufacturer or aftermarket PND supplier. The main conclusion out of this overview is that there are only basic services offered by the OEM's directly. The mobile device manufacturer, e.g. Apple, RIM, Nokia, offer mainly navigation and internet access and miss the connection to the car communication bus for diagnostic services. The most comprehensive product portfolio is offered by the telematic service provider including hardware and software services and only lacking the WLAN connectivity in the car.

The features giving a tier one supplier some unique selling propositions are remote repair and reprogramming, extended CRM with vehicle condition based advertisement in the future and integration of existing features like remote vehicle control, car status report, vehicle tracking and many more offered by the premium brands will be made available for the mid and low priced cars as well.

The understanding of the benefits an OEM can achieve with such an internet enabled vehicle is important for the tier one supplier to align the product offering. Some examples for the OEM relevance are CRM, i.e. higher retention, get feedback from usage scenarios based on collected data, dedicated offer by OEM owned or authorized dealer and repair workshop in case of maintenance or car breakdown using location based information. Extended revenue streams from cross selling, subscriptions services and additional aftermarket purchases.

The proposed business model is derived from the BMI framework introduced in chapter 2.3.3 developed by the Boston Consulting Group. Based on the framework shown in figure 4 the value proposition and operating model are detailed. The target segment consists of OEM's, aftermarket individuals and fleets or commercial customers. In these segments combo boxes, i.e. hardware and software, complete solution service packages, e.g. turnkey solutions, or platforms combined with third party service providers should be delivered to various customers. The revenue collected by selling the hardware box and the related services can be pay for hardware, advertisement or subscription based. Additional aftermarket business for authorized dealers and workshops can generate further sales of optional hardware equipment.

The overview of the end to end solution provided by AutoLinQ^{TM} was presented by Helmut Matschi at the Automobil Elektronik Fachkongress Elektronik in June 2010 in Ludwigsburg and is shown in figure 17 below. In this picture the given business

setup is shown and the required relations to partners in the value creating system are indicated.

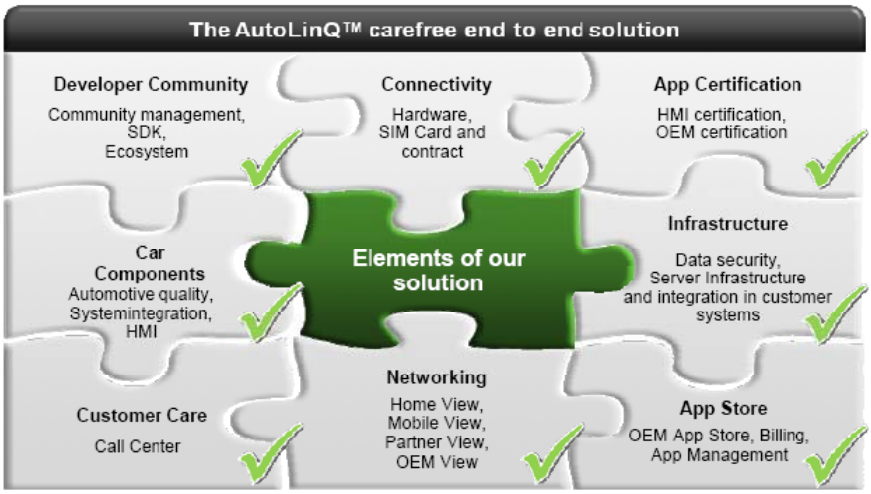

Figure 17. AutoLinQ™ end to end solution

The identified driving application is the combination of internet connectivity with access to the vehicle bus and the enabled data exchange of applications in the vehicle and the server based infrastructure of partnering service providers.
In a second step an internal project was setup by an International Management Program Team from 2010 with the goal to define the business case and go to market planning for a portfolio of connected services and hardware.
The first task was to analyze the market for AutoLinQ™ and to compare the various market trends. A competitor's analysis was performed with the goal to find the right positioning for AutoLinQ™ and to identify the features needed in certain market positions. The main criteria's are the number of features and the cost of the offered system. The cost axis has on the lower end simple mobile phones and on the other side completely integrated solutions from the premium brand OEMs. The feature dimension is more complicated ranging from simple connectivity and device synchronization to safety features, e.g. emergency call, and navigation to complete location based services.
The study focuses especially on the aftermarket solutions with a significant advantage for creating the market before major OEM solutions can be available in new car lines introduced in 2011 or later.
From the report were several recommendations derived for the business unit management to decide on the future direction of the development of AutoLinQ™.

In the business case a detailed calculation was done to compare different market scenarios.
To move the product strategy forward, Continental also has forged a relationship with Deutsche Telekom and other partners in the value net. These alliances create the end-to-end system needed to bring applications to the car. As already demonstrated at the CeBIT presenting the vehicle that Continental developed with Deutsche Telekom is a clear example of how the car of the future will be connected to the cloud—and the cloud will be connected to the car. Intuitively, the vehicle itself and the vehicle owners are able to connect to what matters in their lives.
Devices enabling the internet in the car considered by Continental's business case are Head Units, Telematic boxes, smart phones, aftermarket diagnostic boxes with bluetooth wireless interface.
Just providing a SDK or API for the Android developer community is not working because OEMs do not want unknown 3rd parties creating SW to run on the automotive head units. The OEMs want their own customized applications or at least proven apps.
Revenues can be create by subscription, which is not the first priority, selling embedded hardware modules, e.g. multimedia head units, which is close to the existing revenue stream, application license for a software package installed on every car as a base, consumer selected apps, i.e. downloaded, certification fees from the developer community and sale of collected vehicle data. The last point might lead to some combined business model where the car user gets some other benefits for providing the information, e.g. pay per use for car insurance, free apps or software updates.
The cost side is similar complex including embedded system upgrade cost for latest platform version of Android, cellular network data rate, central server operation costs, software update provisioning and finally the interoperability testing effort for devices and applications.
The balance of revenues and costs is heavily depending on the business model implemented. This will be in fact more than one model, because various customer groups require different solutions.

3.2.2 Open Source

For the selection of Android as the main development platform was based on the business criteria's and secondly on the technical features of the operating system.

The marketing attractiveness provided by the new Android ecosystem pushed by Google and the newly entering companies entering the smart phone business using Android is one point another is the innovative and still growing community. The documentation is available for new developers. A large developer community is already well experienced and the extension to use Continental's SDK can be introduced with low initial effort for them.
Continental will not release any source code to the open source community yet, but internal discussions for a release using an open source license in future.
Alternative solutions were investigated as well, like Apples iOS or Microsoft Windows Mobile OS, RIM or Symbian for Nokia, all of them require a higher effort for tailoring the applications to each platform. But the openness of Google's approach in the Open Handset Alliance has some advantages, e.g. attracting more engineers. Java and OSGI or .NET platform was as well under consideration for Continental but the Android solution offers the lowest entry barriers for new development contributions.
A sole solution for the automotive industry as followed by some of the OEM's, e.g. Toyota, is not giving the same market size for a tier one as the Android ecosystem.
Beside this AutoLinQ™ product Continental is developing applications for other platforms as well, e.g. iPhone app for tire pressure monitoring.
In the Genivi group Continental is a partner as well supporting the further definition of joint application development.
The decision that Continental will develop apps for Android is well considered to leverage the usability of the SDK provided to the developer community. Especially for the OEM's insisting on using only proven applications running on the build in vehicle electronic with connection to diagnostic communication bus a tier one supplier is certainly the first development partner. Continental can use the large software developer community in the Android ecosystem to increase the momentum of engineering power and reduce time to market for innovative applications.
The AutoLinQ™ SDK includes
"*A standard that has many essential patents may suffer from underuse (lack of diffusion)*" (Bekkers et al. 2006: page 7)

An approach to overcome this patent blocking situation in open source based standards is the defensive patent licensing model as described in (Arnoud 2005: page 1).

3.2.3 Applications

The categorization of different use cases is done according the usage scenario of vehicles over 24 hours. The main applications are used in the car view phase when the user is driving the car. The mobile view is valid when the user is away from the car during the day and finally the home view is enabled when the car is parked at home, e.g. in the garage with WLAN connection. A fourth view is the partner view where the required framework including API, SDK and simulation tools are provided. The most important car view includes enhanced trip planning and navigation, social networking, communication / telephony / e-mail, global media access, safe driving, eco driving apps and customized OEM applications, for a complete overview see (Gehrmann 2010: page1)

In the mobile view various application, e.g. online vehicle status and information, context-sensitive vehicle security and control or car finder, are implemented to provide a convenient usage away from the car and being still mobile.

The home view with a connection of the home infrastructure to the vehicle enables additionally the following applications, e.g. driver-specific application selection and download to vehicle, driver-specific vehicle personalization, vehicle diagnostics and dealer access, online owner's manuals, driver-specific vehicle restrictions and owner SMS notifications and enhanced trip planning and navigation.

As shown in figure 18 mobile applications can be divided into four main groups using mobile content in different ways. In this case AutoLinQ^{TM} is clearly a location aware application and in addition to that enabling applications in all other areas for in car usage.

Figure 18. AutoLinQ™ usage scenarios (Gehrmann 2010: page 1)

Here are the main questions for Continental which apps can develop the whole market? What should be developed by Continental? What can be developed from external partners or independent companies or individuals using the development kit provided by Continental? Which apps bring the highest revenue? In addition to the app business can the box be sold in the aftermarket as well and what is the potential revenue there?

A detailed survey was performed to identify the applications with the highest market potential. The results are similar compared to existing industry analysis from iSupply, see (Kim et al. 2010: page 2). The most promising application is the on board navigation either as an OEM or aftermarket solution. The forecast for 2010 is to generate revenue for 290 million USD with one third going to Apple.

Internal market study was performed with several hundred managers within Continental to rank the priority of apps development. The most requested features are real time traffic information, navigation, phone call and services directly linked to driving a car. Continental's core competencies are such as navigation and telematics rather than multimedia only.

Continental will provide an application store concept in the second half of 2010. A key aspect of the AutoLinQ™ concept is to leverage the familiar, established Android™ application ecosystem.

Another key feature provided by Continental is the certification of Apps for in car usage and conformance to safety standards and OEM design guidelines, see (Gehrmann 2010: page 1).

4. Concept Comparison

4.1 General Differences

The strategy origin is a different one the Continental strategy is derived from the strategy of the Division Interior from Continental Automotive. It is clearly developed from the leading position in the main markets of infotainment and connectivity products with the main customer segment of leading OEMs. This is clearly a global strategy. The aftermarket business is covered with lower priority as well. In the developed concept the strategy is derived from a green field approach, i.e. there are no prerequisites for developing the strategy, and the actual situation in the market is the starting point. The development of the market is considered in both approaches in a similar way. The Continental view is more the incumbent position. The general mega trends are influencing the overall cooperation strategy and are detailed for the Interior Division and the impact are considered to a great extend. The outline for the next five years for the strategy is what the automotive industry is used to but for the telecommunications industry with its shorter innovation cycles this might not consider all possible future changes in the business. The long experience in developing and producing for the major OEMs focuses the strategy development from Continental clearly on this customer segment.

The usage of several business models for prototyping different possible scenarios is not common within Continental. The investigation of the patent situation including the patents for smart phones has to deepen to cover more relevant technical concepts and to estimate the potential risks of selecting one open source operating system. The follow up on other concepts and developments is on the one side important for Continental to be part of any organizations and cooperation's defining new technical concepts and on the other side to invest in other business opportunities as well. Within the organizational structure of the different automotive division of Continental this is performed and distributed over several teams and locations therefore Continental is able to react on most of these OEM initiatives.

The market research was performed by Continental and the analysis of existing development partnerships was done as well. A detailed study of the concepts followed by other tier one supplier as the major competitors has to be done in future to collect information on other developments.

The business model with the end user in the central position has to be detailed to provide more possibilities for Continental.

4.1.1 Industry Analysis and Business Model

In the industry analysis the overlapping of automotive and telecommunication was clearly identified in both concepts. As described in (Christensen et al. 2004: page 64), the complementary value networks often make incumbent response easy and this leads to co option between companies. The market segment for the feature of internet connectivity in the vehicle is including many different product groups and technologies that it is clearly necessary to stay flexible as a company like Continental to be able to adopt its own strategy depending on new products and services developing over time from different players in this emerging industry segment. In this fast developing market with new technologies for connectivity, human machine interface, innovative devices available, e.g. tablet PC´s coming up, the strategy to deliver new products and set the pace within the value networks clearly the goal of Continental. The focus of the strategy in the next years should be on selling connected and informed mobility. This will include all the demanding requirements from e-mobility, telematic service for reduced CO2 emissions, car to car communication and personalized customer services.

The business model development should be split into more than one as discussed in chapter 3.1.5. This enables to have more than one focused view on different customer groups, e.g. OEM´s, end user and engineering community in the eco system of Android. Continental has more choices to react on the expected future development within the value net because all the influencing factors will impact the business model setup. The different customer segments need an optimized approach, e.g. for the B2B, e.g. OEM business the classical key account management is the usual way within the automotive industry and Continental as one of the top three tier one supplier worldwide can use the existing customer relationships. The support of the business model of the OEM is one another important factor for the success of this concept because an increased customer loyalty for the Premium brands will increase the revenue potential of Continental. Within the B2C market Continental can use its various brands, i.e. VDO or Continental, to access the aftermarket channels. Once again the existing distribution channels have to be optimized to sell products and services. With the market study Continental clearly identified the aftermarket segment as one with high priority because this will shorten the innovation cycle. The customer community where peers generate value for other peers is more difficult to understand and to generate revenue out of this market. Some dedicated services can contribute to the establishment of the community and the provision of tools and engineering services

can generate positive reputation. The focus on this group has to be increased because for a faster market development the acceptance of the customer and related communities is a prerequisite.
The future development especially in the telecommunication part of the overlapping value network is important because the low number of available software platforms might become a limiting factor. The availability of smart phones using an OS with a large number of applications is one important selection criteria, Continental made here the right decision in selecting Android with its forecasted growing market share. The support for other platforms is opening up more choices for Continental the only question remaining is if the same level of support is required. Developing some applications for iOS or Windows Mobile 7 is not comparable to the AutoLinQ™ concept where a complete SDK and API with connected services are provided.

4.1.2 Open Source Solution AutoLinQ™

There are several patents that might be infringed by the AutoLinQ™ applications. Some of them are listed in Appendix B. In general they use a vehicle build in device that is connected to the car communication network and via a wireless connection, e.g. mobile phone network or WLAN, to any receiving server infrastructure computing the data received from the vehicle.
One solution could be to setup a patent pool and this should be done on the one side by Google for Android and the smart phone device and on the other side for the connectivity to the car electronics and its available data by Continental. The goal here is to give the engineering community the certainty that the developed products can be distributed without any threat of law suits regarding patent infringements. In the next step a patent pool can become the base of a new standard, see (Bekkers et al. 2006: page 7), where the patent pools might facilitate access to patent and thus also may remove a barrier to transferring research results to standards.
Continental's work-in-progress—AutoLinQ™ Connected Services Platform, which auto-makers can configure and rebrand to create their own differentiated suite of apps and services—takes a hybrid approach. Continental will provide the cup-holder and the cup, letting carmakers decide where to get the coffee. The plan is to leverage the work of the Android developer community, with AutoLinQ™ acting as the broker for applications, connectivity, billing and other back-end functions. But consumers won't be able to browse and download at will to their cars. "We believe the automakers will want some degree of control and link to their consumers in their cars for their own branding," says Brian Droessler, vice president of strategy and

portfolio for Continental's Infotainment & Connectivity Business Unit. "We will work with OEMs to host and certify those apps that the OEM will offer to consumers."
Dual licensing could be another choice as well and overcome the contradiction of attracting a community and provide the possibility to develop proprietary solutions. The license EUPL Version 1.1 could be an alternative to the Apache License 2.0. The main differentiation is the redistribution of the source code within the copy left licensing model and other differences are the applicable law and the selection of court.
A commercial open source software distributor has to select a license that is fruitful for the company and attracts the community, see (Hauge & Ziemer 2009: page 73). The license should enable to earn money on the product or related service. A license that is not accepted by the users will prevent the success of the software product. The management of the community is one of the most critical activities in the open source business model. It is the main task for Continental to find the right balance between control over the contributions and the openness to community solutions. On the one side the quality level of the contributions has to be assured and on the other side to much bureaucracy might discourage the community members to contribute. Clear and open communication of the strategy and wanted behavior is important to setup the framework right from the beginning. In (Hauge & Ziemer 2009: page 79) it is recommended that Continental should be part of its own community established and this clearly communicated by Continental that this will be the case. Once again the right balance is necessary because on the on hand the communication and feedback about the usage of the SDK and API can be collected and on the other hand the selection of Continental application development has to be taken carefully. It should provide some reference implementations for the community and develop the whole market. But the selection should not claim all the profitable usage scenarios because than the community contribution will be limited as well.
Therefore the right balance of developing applications and supporting the engineering community to develop their own apps is an important factor that determines the attractiveness of AutoLinQ^{TM} for non Continental contributions to the value creation within the network.
The number of expected updates of the SDK and API is an indication on the maturity of the product but as in the case of Android with regular new versions driving the product development in the smart phone market giving Google still the major control over the value creation network. In the case of AutoLinQ^{TM} this release

policy has to be chosen carefully to build up the trust and confidence within the community that the investment in the development can pay off also over a planned number of releases.

4.1.3 Selected Applications for White Data Services

The described apps in the previous chapters have more in common and only differ in the prioritization. The usage scenarios described in chapter 3.2.3 are the base for the AutoLinQ^{TM} concept to group the most frequently used features within and outside the vehicle. In most of the cases the applications with the highest expected revenues are covered including onetime payment for downloading and service fees on a monthly base.

Another way to categorize the applications and the content delivered to the devices in the vehicle is shown in figure 19 below. The two dimensions are representing the content and information processing and the mobility of the application.

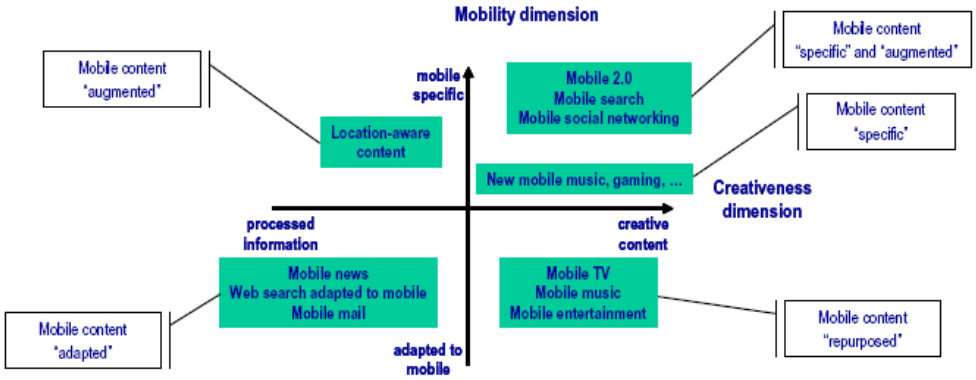

Figure 19. Dimensions of mobile applications, see (Feijoo et al. 2009: page 285)

A social network on wheels is one of the LBS applications that will attract many users, e.g. community services like Facebook, Youtube, twitter combined with traffic data. One limiting factor is the willingness of the users to provide their actual location and enable others to track them. But the possibility to create virtual driving communities can setup a C2C use case. An existing mobile friend-network will expand into moblogs and presence information systems, see (Langley et al. 2009: page 18).

The smart open space provides a horizontal system where multiple service providers can attach to it and advertise their services and information retrieval models which users can choose, see (Gold et al. 2009: page 145).

The combination of location based advertisement and the possibility to perform micro payments with the mobile device will open up another new business case to generate revenue by serving non consumers. The critical issue here is the customer acceptance of mobile advertisement in the vehicle. The usage of additional data on the behavior of the user or usage pattern of the vehicle can enable even more tailored ads and therefore increase the acceptance.
Another large potential is the B2B area especially for fleet management, rental car business and other professional car user. Here customized or only branded apps can generate in the beginning higher revenue due to the onetime payment for development services either from Continental or any other member in the ecosystem.
What is missing in the concept are gaming applications which will represent quite a large part of the potential revenue of mobile apps, see (Pettey & Stevens 2010a: page 1).
The transparency of apps, i.e. the usage on the smart phone and in the build in infotainments system, can provide a single user experience of certain applications. This requires an adoption of the OEM requirements on the user interface and it is difficult to guarantee the same comfort, quality and behavior from a premium brand car on different smart phones.
Some open source applications developed by the community will compete with applications from dedicated companies, see Check NNG global services, ESRI, skobbler, boyges telecom, open street map foundation, public earth, buddi.
This will lead to a mapping of the physical space into the internet by allowing the user to interact with the physical environment through the internet via the use of mobile devices, see (Gold et al. 2009: page 145), by using time stamped location tagged data.
The competitor analysis performed by Continental showed the common traits of the competitors are price point, real-time navigation with location base services, safety functionality and device synchronization. The apps should be focused on the driver needs enabling voice controlled solutions. An additional critical point is the device diversity and derived from that a clear business opportunity not to support only one specific device or platform. The judgment is made from existing smart phone vendors, e.g. HTC delivering Android and Microsoft based products. The internal evaluation of the aftermarket opportunity is very promising looking at the ability to start developing the market earlier using the installed base of vehicles and not to

limit the growth by waiting several months or even years for the introduction of new cars.
In addition the usage of Continental's own brand VDO could even ease the internal decision to set up a team focusing only on this potential market and to become the first development partner within the ecosystem of AutoLinQ™.
Partnering with other companies providing additional value is important for Continental and requires an openness to cross borders into other industries, e.g. tourism, advertisement, gaming and content providers.
Personalized tourism services aim at helping the user finding what they are looking for, e.g. tourist attractions, accommodations, restaurants, other POI, parking lots, routing information based on recommendations. A variety of approaches have been used to perform recommendations in these domains, including content based, collaborative, demographic, knowledge-based or hybrid approaches, see (Kabassi 2010: page 59). Finally the presentation of results involves the technologies used, e.g. multimedia, for improving the interactivity of the systems and, therefore, human–computer interaction.
The law enforcement of speed limits and the recording of vehicle data like in a black box known from airplanes could be some application ideas for the C2B and C2G market segments.

4.2 Improvements

The main improvements of both concepts are the detailed elaboration of the business models derived from the initial business case according the recommendations from Osterwalder and started in chapter 3.1.5.
The selection of several promising concepts is desirable to have more already prepared choices for the prototyping approach on the one side and a better overview of actions taken by competitors in the value network.
The traditional component supplier and other companies, which are new in the sector, will provide these new value adding activities, resulting in a shift of R&D and the value added activities to the component suppliers, see (Cleff et al. 2005: page 140).
App stores are influencing the automotive marketplace with differences compared to the smart phone app stores, e.g. from Apple or Android. These apps have higher requirements for liability, security, safety and HMI and the related branding from OEMs. The expectation from some consultancies is that OEMs will implement of the

shelf solutions distributed via an app store model leading to a higher level of customer relationship management. The role played by partner companies is a significant factor in selecting sales and distribution channels and in finding the sales and distribution strategy, see (Kittlaus 2009: page 105).
The next step for the concept development is to come up with a standard for communication of vehicle data via a connected device like a smart phone including the major tier one supplier and the OEMs. Based on the strategic concept of value networks it is recommended to cooperate on a common standard definition and to compete on the real standard implementation for dedicated product development. Product portfolio will range widely from build in infotainment modules to smart phones as well. This will lead to a fragmented device market targeting to solve the same customer needs.
It is important to understand the symmetries in the game of business, i.e. the first between customers and suppliers and the second between substitutes and complimentary products. Understanding those symmetries can help managers come up with new strategies for changing the game or new applications of existing strategies, see (Nalebuff & Brandenburger, 1995: page 60).
Mobile device suppliers like Apple, Nokia (Symbian development platform or the Ovi platform), or application providers like Google with its Android suite are looking for new profits from the combination of mobile content with their portfolio of products and services, see (Feijoo et al. 2009: page 289).
A mobile app contest sponsored by Continental can trigger the community to start developing many different applications and services. This should be not like the contest performed by VW, see (VW 2010: page 1), where mainly ideas or application prototypes were developed. Instead a similar approach has to be chosen as done by Apple or Google stimulating the app development for their operating system platform. The target should be set internal for a number of apps in total and valuable, e.g. business developing, apps. The internet platform from Android can be used for such a contest and the prices awarded should be above 100.000 EUR in total, including event tickets sponsored by Continental. The setup of a separate student competition can offer student positions and project jobs for students and attract potential future employees.

5. Conclusion

The emergence of new forms of hybrid competition that includes competition and co-operation drives the need for relational strategies and this is a key success factor for mobile ecosystems, see (Gueguen & Isckia 2009: page 53).
In highly uncertain circumstances, the adaption to marketplace signals, retaining flexibility leads to a discovery driven planning, i.e. the first step is to make projections, determine assumptions that proof the projections and finally implement plan to test the assumptions is the emergent strategy recommended in (Christensen et al. 2004: Page 287).
Are there to many open source approaches rivaling in the value network? Beside the Android platform several other Linux based operating systems enable the application development and creation of an ecosystem building upon the platform. In the study performed by (Gueguen & Isckia 2009: page 53) it is confirmed that the ecosystem´s borders are unclear, see chapter 3.1.3. For the developer community it is clear that they will find ways to develop apps only once and then port them to any other platform promising enough revenues.
The main research question in regard for identifying the business opportunities for Continental are developed in chapter 3.1.5. and compared with the actual approach from Continental described in chapter 3.2.1. The revenue model for a tier one supplier cannot only be to develop its own applications instead it should create additional value by selling services, e.g. training, acceptance testing of apps and community support. The hardware used for the data transfer from the vehicle to the mobile device is more the classical business case for a tier one supplier.
Smart phones will become the main device for customers to manage their mobility needs using telematic services, infotainment. These services require reliability, vehicle integration, i.e. embedded connectivity and bandwidth for data streaming. The four different use cases are based on a complete integrated build in variant, smart phone stand alone application, a vehicle using the wireless technology from the smart phone to connect to the internet or an integration of the smart phone device into the vehicles user interface for a seamless driver experience.
The standards to integrate the mobile device into the cars user interface are missing today but they are essential for enabling this application. Many components are already available but the overall integration is missing. There are some activities for example initiated by the ITU and the VDA in Germany, see (Gierlich 2009: page 1) focusing on car communication. This should help to define the needed standards

and all players, e.g. car manufacturer, telecom industry, developer communities and universities can contribute.
A special case is the emerging e-mobility market with on the one side with an innovative touch and openness for new user interface concepts and on the other side with additional requirements on communication needs and telematic services.
The potential revenue scenarios are developed in chapter 3.1.5. and 3.1.6. including the open source licensing model. In regard for the IPR concept the careful selection of the license model is very important and answered in chapter 4.1.2 with the recommendation to use two different license models to target different customer groups.
The key applications should be selected after the list derived from the internal market research and the comparable market studies from various consulting firms. In addition an engineering contest should bring many new apps and start-up the development community for AutoLinQ™.
One example is the concept to include the vehicle as a storage device into the power grid, see (Better Place 2010: page 1). Here the customer interface solution includes the grid management feature for flattening demand and provide different price models depending on the trip time over the day or week to reduce peaks in the energy provisioning.

5.1 Recommendations for Continentals AutoLinQ™ Business Model

Split the business case into different business models, i.e. for OEM, developer community and end customer. The different focus groups on the customer side require a dedicated concept. On the one side the classical customer relations are extended by engineering services for OEMs. This is a new business for Continental and therefore requires a new internal organizational structure to serve a new target organization at the OEM side. On the other side the engineering community is a complete new field of business activity for Continental and the approach already defined with the AutoLinQ™ concept has to be followed consequently with the possibility to react on unforeseen developments and changing needs issued by the developing ecosystem members, e.g. tablet PC.
The general business strategy for Continental has to include other solutions as well. This is realized to some extend already today, e.g. participation in the GENIVI Alliance. The provision of a tire application for the iPhone is a second example for the support of other ecosystems.

Provide and start an app competition for the developer community and sponsor a contest for the best automotive app using the SDK / API of Continental and Android. A project exchange can further stimulate the app development, e.g. people with project ideas can exchange with the community and find a development team to realize new apps.

The most important issue to be investigated in much more detail is the question of patents infringed by the AutoLinQ™ concept. A thorough patent research has to investigate on the relevant patents describing products and services realized by apps based on the AutoLinQ™ SDK / API platform. The list provided in annex 2 can serve as a starting point for this analysis. The resulting patents should be grouped in ones held by various OEMs and others. The next logical step is to form an alliance of the relevant patent holders to cooperate on a common standard of vehicle connectivity to communication devices and related services and data exchange.

5.2 Future Research Work

The further detailed development of consumer types and regions and the mapping of both is the next step. A detailed calculation of potential revenues and related costs is part of a bottom up financial model used for evaluation of several scenarios for the business model evolution taking into consideration the scope described in chapter 3.1.5.

The provisioning of private data will depend on the acceptance of users, i.e. the reward for data delivered to any business using this data for service provisioning, on the one side may limit the success of such business cases and guarantied data security and privacy on the other side may increase the user willingness to sell personal data and personal location profiles. Here further research is necessary to estimate the potential business size.

Potential future changes in the legal regulations of smart phone usage while driving a vehicle a nearly certain for the developed markets in US and European Union. The use of devices with touch screens might be prohibited by these regulations and the user interface will definitely integrate voice recognition and text to speech features. The consequences for the devices in the market segment are a changing feature set, e.g. PNDs will add the voice capability, and a higher growth rate for products with enough computing power to run such features. A difference within the global markets will increase the need for differentiation of products and related feature

costs. The application development will have to take these regional requirements into account as well and provide localized settings for certain legal requirements. Furthermore the enforcement of laws, e.g. speed limits, is another area where the legislation will differ and the governmental allowances. Here the future development once again favors the prototyping concept of the business model development.
The future research in regard of car to car and car to infrastructure communication will influence in the way that more communication channels will be available in future and the actual research for swarm intelligence will increase the location aware knowledge of cars as well.
The car will become intelligent as the horse in former days, e.g. it will find its way home by its own, prevent errors from the driver and still provide a lot of fun for the driver, see (Mitchel et al. 2010: page 46). ”*Streets and roads will be electronically choreographed through use of increasingly precise GPS and other location technologies, onboard sensing and wireless communications*.” (Mitchel et al. 2010: page 41).
The merge of life and social network activities inside and outside the vehicle will provide a complete new driving experience based on today’s smart phones and car electronic.

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List of tables / figures

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Appendix A:

Cooperation	OEM	Tier N	OS Vendor	Content Provider	Applications	Distribution Channel	Connectivity Service Provider	Link	date access
	Ford		Microsoft automotive SW platform	Inrix traffic data	myFord (911 Assist, Vehicle Health Report, Turn by turn navigation)	Ford		http://www.ford.com/about-ford/news-announcements/press-releases/press-releases-detail/pr-myford-touch-makes-easy-vehicle-31715	14.10.10
	Fiat		Microsoft automotive SW platform	TomTom	Blue&Me (Navigation, Mobilephone, Bluetooth, handsfree, steering wheel button control, eco:Drive info, low fuel warning, IQ Routes, trip view)			http://www.fiat.com/cgi-bin/pbrand.dll/FIAT_COM/blueme/blueme.jsp	14.10.10
	Kia/Hyundai		Microsoft automotive SW		UVO (Infotainment and telematics)			http://www.microsoft.com/windowsembedded/en-us/about/casestudies/kia_uvo.mspx	14.10.10
Genivi	BMW GM PSA	Continental Visteon Delphi Magneti Marelli Bosch	Linux MeeGo					http://www.genivi.org/portals/9/news/2009_03_02_Genivi_launch_press_release_final.pdf	18.10.10
								http://www.genivi.org/ABOUT/GENIVIMembers/tabid/430/Default.aspx	18.10.10
	Toyota	Denso	proprietary						
	Toyota		QNX	chumby, Kabillion			Alcatel-Lucent	http://www.ngconnect.org/documents/LTE-Connected-Car-Brochure.pdf	18.10.10
	GM			OnStar	OnStar (diagnostic, vehicle maintenance, emergency service, MyLink for Volt)	OnStar		http://www.onstar.com/web/portal/home	18.10.10
	BMW		proprietary		ConnectedDrive (TeleServices, BMW Assist, BMW Online, BMW Tracking, CallCenter)			http://www.bmw.com/com/de/insights/technology/connecteddrive/overview.html	15.10.10
	Daimler		proprietary	Hughes Telematics	mbrace (vehicle finder, remote door lock, route assistance, wheather, SOS call)			http://mbrace.mbusa.com/services-page.htm	14.10.10
					MyComand (Trip-Assist, Off-Board-Navigation, World Radio, Internet-Telefonie)			http://www.daimler.com/dccom/0-5-1314193-49-1315432-1-0-0-1315357-0-0-135-0-0-0-0-0-0-0-0.html	19.10.10
	Renault			TomTom	Carminat (Navigation, Telefon)			http://www.renault-multimedia.com/de_AT/carminat-gps-navigation/	18.10.10
	Audi			NVidia	Google Earth			http://www.audi.de/de/brand/de/unternehmen/aktuelles.detail.2010~06~audi_und_google_siegerteam.html	19.10.10
	VW				Connected World (information is already exchanged between the vehicle and mobile equipment (MP3 players, smart phones, ...)			http://www.volkswagenag.com/vwag/vwcorp/content/en/innovation/communication_and_networking/connected_world.html	19.10.10
	VW		AdobeFlash/Flex		app my ride			http://www.app-my-ride.com/	03.11.10
	SAIC			InkaNet 3G	AutoNavi, LBS, i-Media, Travel Tips, Walkie Talkie		China Unicom	http://www.auto-chinese.com/tag/inkanet/	15.10.10
Autoling		Continental	Google Android	Navteq	Navigon, Pandora, SVOX, Ygomi, Inrix		Telekom	http://www.autolinq.de/en/	18.10.10
		Continental	Microsoft Auto 4.1		Phone, Radio, Bluetooth, Phonebook			http://www.microsoft.com/windowsembedded/en-us/products/windows-embedded-automotive/default.mspx	18.10.10
		Denso	Microsoft automotive SW					http://www.microsoft.com/presspass/press/2010/jul10/07-07msjulypatentpr.mspx	14.10.10
		Denso			Blue Harmony Infotainment System			http://www.densomedia-na.com/naias2010/technology/blue_harmony_naias_final.pdf	18.10.10
		Visteon			SaaS, Apps2market	apps2market		http://www.visteon.com/media/newsroom/2010/100107_story1.html	14.10.10
		Pioneer			PAIS platform			http://www.pioneerelectronics.com/PUSA/PressRoom/Press+Releases/Pioneer+Opens+Its+Platform+for+Aggregation+of+Internet+Services+(PAIS)+to+Rival+Connected+Devices	18.10.10
		Bosch	Montavista LINUX					http://www.mvista.com/press_release_detail.php?fid=news/2010/MontaVista-Robert_Bosch_Car_Multimedia_Sign_Agreement.html	18.10.10
		ZF			openmatics, maintenance management, bus telematics			http://www.zf.com/corporate/de/press/press_releases/press_release.jsp?newsId=21738987	27.10.10
			Nokia owns ->	Navteq	Map supplier			http://corporate.navteq.com/products_data_ncs.htm	18.10.10
				Teleatlas	Map supplier	TomTom		http://www.teleatlas.com/index.htm	18.10.10
				iBiquity	Radio			http://www.ibiquity.com/automotive	18.10.10
				Telenav	Navigation		USCellular, Sprint, T-Mobile	http://www.telenav.com/products/auto/	18.10.10
				ALK	Navigation, Live Traffic Information, Fuel Price	appStore		http://www.alk.eu.com/copilot/iphone/	18.10.10
				Pandora	Internet Radio (music streaming)	appStore (Apple..)		http://itunes.apple.com/us/app/pandoralink-for-pioneer/id366448303?mt=8	18.10.10
				Inrix traffic	trafic condition from crowd sourced data	appStore		http://www.inrix.com/pressrelease.asp?ID=75	18.10.10

Table 4. Existing Cooperation's

Appendix B
Patents listed here:

Pat.No.	Title	Date	Rel.	Distinctions	Company
EP1197396A2	Wireless Access to Embedded Networks	06.10.2001	yes	CAN Bluetooth Gateway, OBD II, GSM	Robert Bosch GmbH
US6389337B1	Transacting E-Commerce related to identifying and procuring automotive service and vehicle parts	03.05.2000	yes	e-mail, e-commerce, invehicle wireless connection, GPS, vehicle data	
US6408232B1	Wireless Piconet Access to Vehicle Operational Statistics	18.04.2000	yes	Bluetooth, Access Point	Agere Systems Guardian
US6564127B1	Data Collection Via a Wireless Communication System	25.10.2000	yes	GSM, GPS, vehicle data, server infrastructure	GM
US6697638B1	Intelligent Portable Phone with Dual Mode Operation for Automobile Use	29.10.1999	yes	Carkit, Bluetooth, handsfree,	Denso Corp.
US7076255B2	Context-Aware and Location-Aware Cellular Phones and Methods	22.12.2000	yes	Methods	Microsoft Corp.
US7113865B2	Roadway Travel Data Exchange Network	15.12.2003	yes	Methods, GPS, Mobile Phone, PDA, Box	?
US7532963B1	Internet-Based Vehicle-Diagnostic System	30.11.2007	yes	OBD II, wireless,	HTI IP, LLC
US20020130769A1	Vehicle Management System	11.03.2002	yes	Mobile Phone, GPS, fingerprint, theft location, alarm, fuel level, door status	?
US20030109972A1	Drivers Vehicle Diagnostic Apparatus and Early Warning	11.12.2002	yes	Server, Maintenance, Wireless, Car data, diagnostic vehicle state	SHT Co Ldt.
US20040203370A1	Wireless Gateway Node	30.09.2002	yes	Box, Mobile phone, WLAN, GPS,	?
US20040210363A1	Repair and Maintenance Support System and a Car Corresponding to the System	07.05.2004	yes	Box, navigation, GPS, Bluetooth, GSM	Hitachi Ltd.
US20060212194A1	Vehicle Communications Using the Internet	01.06.2006	yes	prognostic of failure for maintanence, pattern recognition, wireless internet	Automotive Technologies Int. Inc.
US20080316006A1	Method and System for Communicating Vehicle Diagnostic Data to Internet Server via Bluetooth enabled cell Phone for Subsequent Retrieval	22.06.2007	yes	Bluetooth, diagnostic box, server, handsfree kit,	Lear Corporation
US20090112393A1	Generating Vehicle Trip Expenses and Projected Maintenance Needs	25.10.2007	yes	telematic unit, server, call center, planning maintenance,	?
US20040176935A1	Facilitating Communication with Automotive Vehicle Buses	04.03.2003	yes	Server in box, device and server architecture, wireless to internet, authentication	Microsoft Corp.
US20060247833A1	System and Method for Remote Acquisition of Automotive Data from a Vehicle	29.04.2005	yes	GSM, WLAN, telematics subsystem	GM
US20080272906A1	Vehicle Monitoring Using Cellular Phones	30.10.2007	yes	monitoring interior with cell phone, Bluetooth, WLAN, sensors, container data logging, GPS, RFID,	intelligent technologies international inc.
US20090125178A1	Automotive ECU Mobile Phone Interface	13.06.2006	yes	GSM, mobile phone, Internet server, readable data	?
US20090210155A1	Automotive Entertainment, Communication, Navigation and Control Center	19.01.2009	yes	infotainment system, control, fleetmanagement, GPS, GSM	Horizon Semiconductors Ltd.
WO2007078968A2	Communication of Automotive Diagnostic Data	20.12.2006	yes	MIL indication OBD, mobile phone, box, connector, server	General Instrument
WO2010000262A1	A Device For Making Diagnostic Tests on a Vehicle	06.06.2009	yes	mobilephone, Bluetooth, Internet server, box, GSM, GPS	Nijunge, Care2wear

Table 5. List of relevant patents