

European Automotive OEMs: leveraging connected
technologies and digitalization as a vital prerequisite
to sustain
Coping with the changing customer demand in a disruptive
business environment

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

supervised by
Univ.Prof. Dr.Ing. Dipl.-Ing. Prof.eh. Dr.h.c. Wilfried Sihm

Michael Schmidt

9204875

Hielke Ytsma

1525963

Vienna, 29.09.2017

Affidavit

I, **MICHAEL SCHMIDT**, hereby declare

1. that I am the sole author of the chapters 5-8 (p.17-62), and the co-author of the chapters 1-4 (p.10-16) and 15-18 (p.129-151) of the present Master's Thesis, "EUROPEAN AUTOMOTIVE OEMs: LEVERAGING CONNECTED TECHNOLOGIES AND DIGITALIZATION AS A VITAL PREREQUISITE TO SUSTAIN – COPING WITH THE CHANGING CUSTOMER DEMAND IN A DISTUPTIVE BUSNIESS ENVIRONMENT", 171 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, 29.09.2017

Signature

I, **HIELKE YTSMA**, hereby declare

1. that I am the sole author of the chapters 9-14 (p.63-128), and the co-author of the chapters 1-4 (p.10-16) and 15-18 (p.129-151) of the present Master's Thesis, "EUROPEAN AUTOMOTIVE OEMs: LEVERAGING CONNECTED TECHNOLOGIES AND DIGITALIZATION AS A VITAL PREREQUISITE TO SUSTAIN – COPING WITH THE CHANGING CUSTOMER DEMAND IN A DISTUPTIVE BUSNIESS ENVIRONMENT ", 171 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, 29.09.2017

Signature

Acknowledgements

- Hielke Ytsma -

I would like to take this opportunity to reflect on the past two years, the duration of this MBA program. It has been a life-changing experience for me, a true rollercoaster ride that pauses, only shortly, with the submission of this Master's Thesis. During this short pause, I take the opportunity to thank my parents for supporting me in pursuing my goals, encouraging me to never stop asking and take nothing for granted. And of course, my sister and her husband for showing the way in the academic world and challenging ideas that I have. Above all, I would like to thank them for their never tiring love and patience while I was somewhere around the globe converting at least a part of my dreams into reality.

During the MBA program, I had the privilege to meet and get to know this colorful group of people; my fellow-students. I would like to thank them for the energy, enthusiasm and intellectual discussion, making the long weekends in Vienna and Bratislava an even more interesting experience.

And finally, Michael Schmidt, my co-author and dear friend, with whom I spent many long nights and days to complete this work. I admire his never-ending drive to make things "a touch better" and his different view on the automotive industry, which was so needed during the creation of this Thesis.

- Michael M. Schmidt -

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Abstract

This Master Thesis will assess the question; how much digitalization, and connected technology is of importance to sustain as an automotive OEM in the long run. Our research focuses on the 3 leading German premium OEMs namely Audi, BMW and Mercedes, a Daimler brand, as we believe they provide a representative picture of the overall OEM's status quo when it comes to applying connected technology and digitization in their vehicles.

In addition, we will study whether digitalization and connected technologies are vital prerequisites to be understood and embraced in full by automotive OEMs in order to sustain as a brand, or even as an entire industry. In order to study this and find supporting evidence to confirm our hypothesis, we created a model allowing us to combine the behavior of the customer, the (mega)trends within society, the business structure of the automotive industry as well as the (smart)phone industry and the offerings of the chosen 3 German OEMs. The inputs for this model are based on available datasets provided by global acting research institutes, qualitative analysis, and scientific research papers.

By applying the Porter's 5 Forces (P5F) model to assess the industry and its connected offering, and blending our findings with customer behavior, customer generation assessment, and mega trends influencing the automotive industry, we aim to improve our understanding of where the chosen OEMs and – pars pro toto – the entire automotive industry is situated and heading to, in regard to connected technology. Comparing the automotive industry with the mobile/smartphone industry and its inherent business disruption that occurred starting in the mid-2000s, we intend to transparently showcase both the growing force of the buyer, and the lack of customer understanding leading to new entrants taking over a mature and established market place.

Placing a special focus on the upcoming Self-Aware and Self-Centered customer generations (Y & Z), and their disruptive change in purchase behavior, brand perception, and information gathering, will assist in understanding future needs when it comes to creating relevant mobility products for the end customer.

We will expand on the fact that these new customer generations especially are profoundly keen to select brands and products that are integrated into their digital life and are relevant to fulfil their needs, hence are loyal to them. At the same time, we intend to raise attention to the fact that the same customer segment has changed an entire mobile/smart phone industry, and that ignoring the relevance of a product for their needs, even as a mature and leading market player, may create a highly negative impact for a given business.

Concluding our research, we intend to mirror the current status quo of the 3 researched German automotive OEMs and compare it with the perceived direction we believe these companies, and, additionally, the entire automotive industry, must develop in order to remain successful. We will give high-level recommendations that shall help address the necessary changes to initiate the change needed to adapt to – what we believe to be – an emerging new market reality.

Table of contents

| | |
|--|----|
| 1. Introduction | 10 |
| 1.1 Motivation | 10 |
| 2. Research problem, question and hypothesis | 12 |
| 2.1 Definition of the research problem | 12 |
| 2.2 Outline of the main research question | 12 |
| 2.3 Description of the hypothesis | 12 |
| 3. Section on background information | 13 |
| 4. Modelling | 14 |
| 4.1 Introduction | 14 |
| 4.2 Constructing a model | 15 |
| 4.3 The model | 15 |
| 5. Business and Research on the changing customer | 17 |
| 5.1 Introduction | 17 |
| 5.2 Behavioral Economics - Understanding the psychology of human purchase decision making | 18 |
| 5.2.1 Behavioral Finance | 22 |
| 5.2.2 Observations in the Behavioral Economics | 23 |
| 5.2.2.1 The fear of loss vs. excitement to gain | 23 |
| 5.2.2.2 Mental Accounting | 24 |
| 5.2.2.3 Heuristics | 25 |
| 5.2.2.4 Disposition effects | 26 |
| 5.2.2.5 Framing | 27 |
| 5.2.2.6 Market inefficiencies | 27 |
| 6. The Consumer decision journey | 29 |
| 6.1 Introduction | 29 |
| 6.2 The consumer Funnel | 29 |
| 6.3 Consumer's Decision-making factors | 31 |
| 6.4 Rational/Irrational Decision-making Process | 33 |
| 6.5 Change of purchasing behavior induced by digital technology | 34 |
| 7. Megatrends in the automotive industry | 36 |
| 7.1 Introduction | 36 |
| 7.2 General trends | 37 |

| | |
|---|-----------|
| 7.3 Major Disruptive trends _____ | 39 |
| 7.4 Adapting to the SELF area _____ | 44 |
| 7.5 New Mobility Services (NMS) influencing the automotive industry _____ | 47 |
| 7.6 New entrants challenging traditional players _____ | 51 |
| 8. Disruptive Behavior of the Millennials and Generation Z _____ | 52 |
| 8.1 Introduction _____ | 52 |
| 8.2 Customer generations _____ | 52 |
| 8.3 Gen Z purchasing priorities _____ | 55 |
| 8.4 Influence of Technology _____ | 56 |
| 8.5 Shift of customer demands from product centric to service centric _____ | 58 |
| 9. Framework of how to assess the Automotive Industry and compare it with other industries _____ | 63 |
| 9.1 Introduction _____ | 63 |
| 9.2 Porter's Five Forces _____ | 64 |
| 9.3 The Five Forces model _____ | 65 |
| 9.4 Conclusion _____ | 67 |
| 10. Selection of OEMs and the industry to compare the automotive industry with _____ | 68 |
| 10.1 Introduction _____ | 68 |
| 10.2 The Region _____ | 68 |
| 10.3 The OEMs _____ | 70 |
| 10.4 Non-Automotive Industries _____ | 72 |
| 11. Assessment of the Automotive Industry _____ | 73 |
| 11.1 Threat of Entry _____ | 73 |
| 11.1.1 Supply-side economies of scale _____ | 74 |
| 11.1.2 Demand-side benefits of scale _____ | 74 |
| 11.1.3 Customer switching cost _____ | 75 |
| 11.1.4 Capital requirements _____ | 75 |
| 11.1.5 Incumbency advantages independent size _____ | 76 |
| 11.1.6 Unequal access to distribution channels _____ | 77 |
| 11.1.7 Restrictive government policy _____ | 77 |
| 11.1.8 Expected Retaliation _____ | 78 |
| 11.2 The Power of Suppliers _____ | 78 |

| | |
|--|------------|
| 11.3 The Power of Buyers _____ | 81 |
| 11.4 The Threat of Substitutes _____ | 83 |
| 11.5 Rivalry _____ | 85 |
| 11.6 Demand-side Sub-forces _____ | 89 |
| 11.7 Conclusion of the Automotive Industry Assessment according to Porter's 5 Force _____ | 91 |
| 12. Business structure assessment mobile phone industry | 93 |
| 12.1 Threat of Entry _____ | 95 |
| 12.1.1 Supply-side economies of scale _____ | 95 |
| 12.1.2 Demand-side benefits of scale _____ | 95 |
| 12.1.3 Customer switching cost _____ | 96 |
| 12.1.4 Capital requirements _____ | 96 |
| 12.1.5 Incumbency advantages, access to distribution Channels and retaliation _____ | 97 |
| 12.2 The Power of Suppliers _____ | 98 |
| 12.2.1 Concentration of the industry and dependability of the industry _____ | 98 |
| 12.3 The Power of Buyers _____ | 99 |
| 12.4 The Threat of Substitutes _____ | 100 |
| 12.5 Rivalry among Existing Competitors _____ | 101 |
| 12.6 Conclusion of the Mobile Phone and Smartphone Industry Assessment according to Porter's 5 Forces _____ | 102 |
| 13. Defining the Connected Car Ecosystem _____ | 104 |
| 13.1 Overview of the Eco-system _____ | 104 |
| 13.2 In-vehicle hardware _____ | 105 |
| 13.3 Data communication _____ | 106 |
| 13.4 Off-board technology or IT-infrastructure _____ | 106 |
| 13.5 Features and use-cases _____ | 109 |
| 13.6 Beneficiaries _____ | 110 |
| 14. Connected Services offered by German Premium OEMs | 111 |
| 14.1 Selection of the 3, premium, German OEMs _____ | 111 |
| 14.2 Offerings of Connected Services in Europe _____ | 113 |
| 14.2.1 Audi _____ | 114 |
| 14.2.2 BMW _____ | 118 |
| 14.2.2.1 BMW Ecosystem Architecture | 122 |

| | |
|--|-----|
| 14.2.3 Daimler (Mercedes) | 123 |
| 14.3 Scoring the Connected Car features | 126 |
| 15. Relation between Customer Decision Journey and the industry assessment according to Porters' 5 Forces | 129 |
| 15.1 Parallel between the automotive industry with (smart)phone industry | 134 |
| 15.2 Dissimilarities between the automotive industry with (smart)phone industry | 135 |
| 16. Relation between the consumer journey and the offerings from the automotive industry | 138 |
| 16.1 Introduction | 138 |
| 16.2 Connected Car offerings | 139 |
| 17. Conclusion | 142 |
| 17.1 Hypothesis and Research Questions | 142 |
| 17.2 Discussion | 144 |
| 18. Recommendations | 146 |
| 18.1 Adapting the organization to change | 147 |
| 18.2 Identifying and building new talent | 148 |
| 18.3 Developing new partnerships | 149 |
| 18.4 Developing new partnerships | 150 |
| Citations and referred journals | 152 |
| Literature references | 165 |
| List of abbreviations | 168 |
| List of pictures | 169 |
| List of tables | 171 |

Chapter 1: Introduction (Schmidt & Ytsma)

1.1 Motivation

The motive for writing this Master's Thesis together is to combine experience, knowledge, professional expertise, and expectation of two opposing parts of the industry; technology and marketing. Choosing the topic of this Master's Thesis, we intend to leverage both our technical (Hielke Ytsma) and marketing (Michael Schmidt) background, aiming to add a valuable and foreseeing contribution to the current discourse on where the automotive industry – and especially the European OEMs – will be in the future.

Our effort in understanding and tackling this challenge is driven by two factors:

- Firstly, we believe that connected technology is enabling what we perceive being the future of automotive mobility. An individual experience that is content rich and meeting the personalized expectations;
- Secondly, we believe that the identified topic will - although it might sound very provocative - once fully realized, change the automotive landscape and distribution with regards to size, value and profit amongst the various stakeholders, including the largest; the OEMs.

Having the welcome opportunity of working directly in the automotive industry, or affiliated industries, we have encountered many events and situations where decision-makers are struggling finding the right arguments to make decisions that are related to digitalization or connected technology. The main reasons for this indecisiveness being:

- Digitalization and connected technology are not in the DNA of the automotive industry.
- The return on investment in digital or connected technologies are hard(er) to value. The opportunity cost is high; i.e. development of a new feature that is directly related to the functioning of a vehicle, in order to stay ahead of the competition.
- World-wide trends such as urbanization, and the “Fully Connected Life” are known, but the relevance for the automotive industry, or a specific brand, is hard to define.

This indecisiveness is resulting in connected features which are only currently released to the market at a late stage. As a result, the perceived value of the connected features to the customer swiftly diminishes, sometimes even to the point of becoming obsolete. Another possible scenario is that the automotive industry provides content through connected technology which is not unique. The cycle time of the automotive, and the development of new (connected) technologies, is long(er) when compared to potential rivals such as the big IT companies, resulting in the fact that content may be obtained through other screens and channels - like the smartphone - in a more integrated, up-to-date fashion.

Our belief is that solid investments, combined with substantial collaboration with technology incubators from outside the automotive industry, will be required from the OEMs in to offer relevant, connected features in a timely manner. For some brands, this ability may even be crucial to sustain in the long term. However, current literature and information from consultancy companies provides no answers to the question regarding where to invest in, or even providing the direction that many of the OEM's decision-makers are looking for. The aim of this Master's Thesis is to not only answer the research questions, which will be discussed and explained in chapter 2, but also provide a model which allows strategists and decision-makers to understand:

- The global trends and the changed customer purchasing behavior;
- The business structure; what is influencing the profitability of the industry or a brand;
- The current feature offerings that are connected car related

Understanding the above will enable strategists and decision-makers to understand, evaluate, and value the importance of global trends and customer purchasing behavior changes, identifying, which amongst them will have a (in)direct influence on the profitability of their business and industry. We aim to develop and test this model as part of the Thesis, but acknowledge beforehand that further development and discussion will be required to make it fully suitable for application within the automotive industry and, potentially, other industries of which the business structure will be influenced by the rapid digitalization of the world. It is important to note that we are not aiming to defy the investigation results of renowned consultancy firms or scientific papers. In contrast, we aim to use these results and apply them in a particular way, so that they are directly valid for an industry or a particular OEM.

Chapter 2: Research problem, question and hypothesis (Schmidt & Ytsma)

2.1 Definition of the research problem

European OEMs appear to be unable to sufficiently adapt to the changing business environment created by the rapidly altering customer expectations induced by connected technologies, big data harvesting and digitalization.

2.2 Outline of the main research question

Is digitalization and connectivity forcing OEMs to disruptively change their business model to stay profitable and relevant to the needs of their customers?

1. What are the future needs of the customer with regards to the automotive business?
2. Is the current automotive business model of OEM's sustainable for the future?
3. What are the adaptations needed to keep OEMs profitable?
4. Are the 3 German, premium OEMs able to address the changing demand of the customers through offering digital services, based on the Connected Car.

2.3 Description of the hypothesis

5. Content and features will be key that continue to evolve after start of production and while the vehicle is in use.
6. The expectation of the customer will need to be satisfied or exceeded to sustain as a business.
7. The model itself will shift from being a sole hardware focused to mobility as a service to a content provider.
8. The critical triangle is formed by:
 - End-customer
 - Society
 - Automotive industry

Chapter 3: Section on background information (Schmidt & Ytsma)

When investigating and researching background information on the topic of this Master's Thesis, it became apparent that extensive research results, previously carried out, and on the chosen topic regarding this thesis, were difficult to obtain. Important building blocks, that would lead to answering the research question, are available. However, a combination of the building blocks, or the existence of a model which allows an industry-agnostic assessment of the relevance of trends and customer purchasing behavioral changes for an industry or brand, was unavailable.

In recent decades, the irrational behavior of humans and their purchasing decisions have been studied by renowned scientists such as, Daniel Kahneman, Dan Ariely, and Richard Thaler; who won the Nobel Prize in economics on the 9th of October 2017. All three blend psychology with the hard, mathematical approach of economics, and this stance will be adopted throughout this Master's Thesis.

Trends and global movements that influence the automotive industry directly, or indirectly, are obtained through research companies that use their global spread and large footprint to evaluate the minor changes which potentially indicate a major change of direction or a new trend.

For the assessment of profitability, as well as the threats and opportunities outside and within the automotive industry, Porter's Five Forces, and the scientific papers surrounding this renowned model, are reviewed and applied accordingly. The data, necessary to quantify the Five Forces, are obtained through sources ranging from financial statement of the relevant companies, to the results of consultancy companies and authorities in the specific areas.

Chapter 4: Modelling (Schmidt & Ytsma)

4.1 Introduction

While preparing for the strategy that would allow us to answer the research question, we began to realize that current, scientific literature isn't providing us the holistic view that encompasses the 3 main forces; end-customer, society and the automotive industry. On the contrary, excellent studies, from renowned institutes, were found describing:

- The relation between behavioral economics and marketing
- The customer's decision journey
- The Connected Car; both features and technology
- (Mega)trends in the society
- The automotive industry

However, there is no literature available providing a model allowing us to combine the following key factors that are key in answering the research questions, which will eventually support, test, and validate the hypothesis of this Master's Thesis:

- Assessment of the profitability and value contribution of the automotive industry business
- Purchasing behavior of end-customers in a market place that is heavily influenced by (mega)trends
- Offerings in the Connected Car space by European OEMs

The novelty of this Master's Thesis is to provide a model which isn't focused on the technology enabling new features, nor the hypes that may, or may not, be relevant to the industry. Instead, this thesis takes a holistic approach in understanding whether new features are deemed to be crucial for an industry to remain profitable and sustainable, with a strong focus on the end-customer.

This model, which will be developed as part of this Thesis, will be applied to the automotive industry. We should note that it is the first attempt in creating a model which encompasses the above and we expect to refine and validate the relevance of it over time. Furthermore, it is expected that the same holistic view can, and will, be applied to other industries, as well to provide business strategists the tools to make the right decision from a customer benefits viewpoint, rather than a technology driven approach.

4.2 Constructing a model

The model that will be created as part of the Thesis includes the following elements:

- 4 legs:
 - Customer
 - Trends
 - Industry structure
 - Offerings
- 2 Recaps:
 - Relation between Customer/Trends and the Industry structure
 - Relation between the Customer/Trends and the Offerings of the industry (or specific players)
- Conclusion:
 - This will answer to what extent the offerings of the industry are meeting the changing demands of the customers, and their decision journey, across the various demographics and specific market segments. Taking into considering the (mega)trends of the society and bearing in mind the existing business structure of the automotive industry.

In a mere consultancy fashion, the conclusion would support strategists to make decisions which ensure the sustainability of the industry. Whereas, for this Master's Thesis, the same conclusion will also provide answers to the research questions, supporting the hypothesis of the Thesis.

4.3 The model

The "Influence Model", including the components discussed in the previous paragraph, will be used to structure the Thesis. We will start with describing the 4 "legs", followed by the 2 "recaps" and finally conclusion, which leads to the hypothesis of the Thesis. The structure of evidence collection ("legs") and partial conclusions ("recaps") is visualized in the following graphical representation.

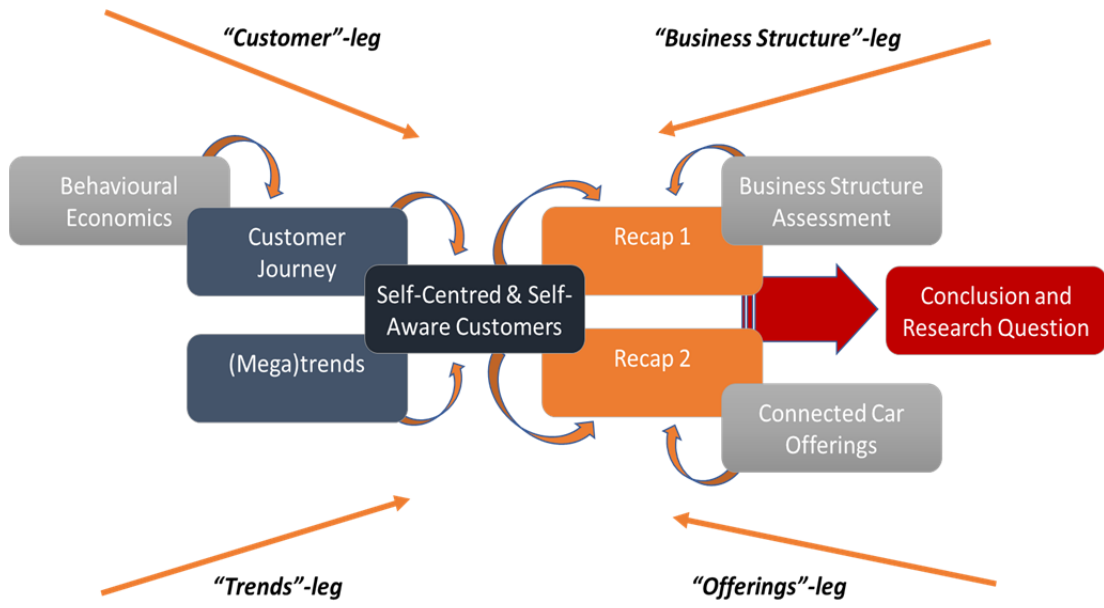


Figure 1: Influence Model – Customer-Industry-Society

Chapter 5: Business and Research on the changing customer behavior (Schmidt)

5.1 Introduction

As a starting point and highly influential factor within our model, as well as to build on our understanding regarding what creates consumer demand, we are looking into human purchasing behavior. Blending economics with psychology, behavioral economics, and its sub-field, behavioral finance, will help us to understand the drivers within customers in order to better interpret decision-making factors directly reflecting onto:

- the future customer demands;
- purchasing arguments and
- the value of brand/brand positioning.

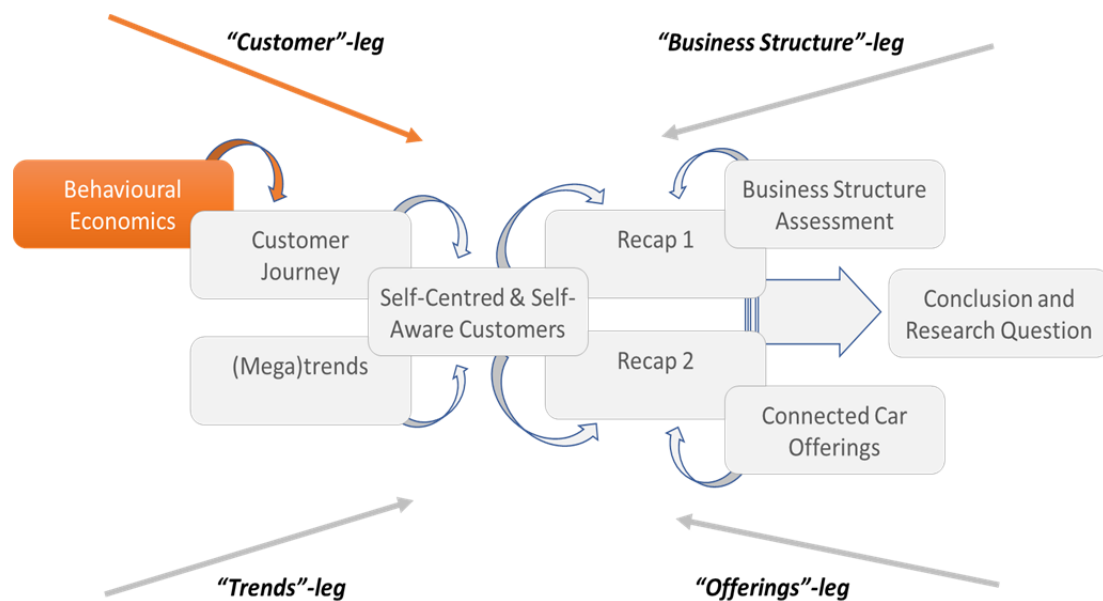


Figure 2: Influence Model – Behavioral Economics

5.2 Behavioral Economics - Understanding the psychology of human purchase decision making

Generally spoken, behavioral economics is the research field which implies that human decisions and choices are influenced by the way choices are presented to us. Contrary to this, a principle known as rational choice theory suggests that people always make logical decisions. It assumes that an individual actively tries to maximize its benefits and minimize the losses by making choices that are based on rational decisions and logical thinking. However, decisions that result from careful analysis of costs and benefits associated with existing preferences are possible only in an ideal world.

However, in reality, emotions play a significant role in affecting the behavior of the customers to influence their decision-making. There are many cognitive biases and social influences resulting from less deliberative and controlled processes which vary across time and place.



Figure 3: Behavioral Economics model. ^[1]

Behavioral Economics merges insights from psychology and economics and provides a framework to understand how, and when, customers make a specific decision. This contradicts the conventional ideology and concepts in human purchase decision-making. “The view of the homo economus who is generally practical as well as selfish and comparatively stable, is complemented and challenged by behavioral economics which is based upon assumptions that suggest that human decisions and choices are not made in isolation” ^[2].

Behavioral economics considers cognitive and emotional dimensions along with the social forces that shape up the decision-making of an individual. The standard and traditional policy is to provide all possible choices and let the customer choose the best one as per their preference. Besides, behavioral economics also considers the limited cognitive abilities to make choices profoundly influenced by the context and greatest immediate appeal, as an attribute of human's inconsistency and fallibility.

Different regions of the brain, namely the limbic system, cortex and recumbent part, are collectively responsible for influencing the behavior towards a decision. The limbic system, dealing with emotions, works very quickly and does not follow logic. The cortex, however, is associated with learning, planning, and calculative logical thinking, and so it takes time to make a decision. Therefore, the interplay and amount of contribution by these brain regions determines the rationality of an individual's choice.

"Behavioral economics as it is today:

1. uses scientific methodology of social sciences (similar to experimental economics);
2. is funded on positivist principles that come out of realistic assumptions;
3. strives for generality by enriching the standard model, and
4. targets at rising the explanatory as well as the analytical scope of the economic theories by giving this more sensitively reasonable concepts

"The research in behavioral economics is divided between two fields:

1. studies and research on judgments deals with the processes that people use for estimating the probabilities and
2. research on choice which deals with the processes people use for selecting among their actions" ^[3].

Lastly, "the behavioral economics recommends different methods and systems how the policy maker may reorganize the surroundings in order to provide better alternatives" ^[4]. This rearrangement of physical environment and choices manipulates the salience of options. Therefore, triggering the emotional response to products rather than what the product offers, is the secret in triggering impulse buying.

For major purchases, such as cars, consumers do not hesitate in devoting great investments of time and efforts along with the money. Before purchasing vehicles, consumers often research by interacting with peers such as friends, family, and colleagues, besides relying on online and offline media. Thus, going for such major purchases often makes the decision-making process more difficult and unconfident due of lack of previous experiences.

Therefore, the marketing approaches for such major purchase-making market segments are different from less expensive purchases. Different marketing strategies are thus required in order to effectively influence the buying decisions in such, comparatively, non-impulse items.

These marketing strategies include various methods to help the consumer define its choices:

- default options
- offering free trials
- anchoring
- filtering

Default Options

By providing default options to the consumer, the marketers increase the likelihood of choosing it by making them value the ownership of that default option. This option works best when the consumer is too confused, or indifferent when forming a decision, by eliminating the need to make a choice. An additional advantage of default options is that it frees the consumer from 'choice overload'; another method of overcoming the 'choice overload' is by filtering.

Free trials

Similarly, by offering free trials for a decent period of time to prospective customers, a sense of ownership can be developed. This tends to convince people to stay committed to a purchase and actually buy the product. In addition, free trials also help in leveraging the loss aversion. ("Loss aversion" will be explained in a following paragraph)

Anchoring

Anchoring in same way helps in customer management, especially in cases of negotiation. "Anchoring may be specified as the particular kind of important result whereas the initial exposure to the several prices behaves like a reference point and therefore this has subsequent decisions in the process of making decisions" ^[5].

anchors do not usually have any direct relevance to a decision as any idea or value, once firmly anchored in an individual's mind, can lead to automatic decisions and behaviors. Marketers are often aware that their anchor is imperfect and try to make adjustments to reflect subsequent information and analysis. For instance, customers may walk onto a car lot and note a sticker price, and then subsequently use that number as their starting point for further negotiations and decisions.

Filtering

The studies by McCain draw a basic idea that human choice behavior is arisen from the interaction of a stream of impulses with a system of filters. The filtering suppresses, passes, or transforms the impulses. "While doing so, the filters express a wide range of motivations and influences, in which utility maximization is only one of such motivations" ^[6]. Filtering tends to claim selective attention or retention to a given piece of information irrespective of its relevance. When a need to make a choice arises, the challenge is to address the choices, filter and respond. This filtering is conducted through mental models as well as predispositions. The filtering process comprises questioning biases and assumptions held of a certain company, product service or brand.

Hence, there are various principles and approaches in behavioral economics to have a strong and profound impact on decision-making process of the consumer thus influencing its choice. Understanding the irrationality in the consumer behavior will help the marketers to unlock significant value by encouraging developments while paying attention in various disciplines of both traditional and behavioral economics.

5.2.1 Behavioral finance

Behavioral finance shall help us to better understand the trigger points as of when financial decisions are made, and the mechanisms underlying the sole rationales of purchasing certain items. Behavioral finance is a related field to behavioral economics and fills the gap between rational and irrational decision-making by blending scientific insights of cognitive reasoning with traditional economics and financial theory.

There are a number of elements in behavioral finance that help in deriving behavioral patterns combined with logical thinking. Behavioral finance encompasses a number of psychological biases and limitations including:

- herd instinct
- confirmation bias
- bounded rationality
- loss denial
- disposition effect.

Thorough information and categorization of the available choices in the market affect the decision making of the customers.

- 1) *Herd* - Social evidences indicate that it is our tendency to run with the '*herd*'. Thus, we tend to make decisions based on the choice of people who are around us. By validating the decision of majority in actions of similar course, we often convince ourselves of the decision made. Marketers often find application in these herd instincts by promoting, 'best-sellers' or, 'People's choice'.
- 2) *Confirmation Bias* - this phenomenon explains the seeking out of specific information, and overlooking other potentially useful facts to make a choice that does not coincide with the existing perceptions and opinions of the consumer. Confirmation bias can thus influence the investors to make poor and less-optimal decisions.

- 3) *Loss aversion* – people tend to be more worried and avoid potential losses than seeking the potential returns.
- 4) *Bounded rationality* – suggests that the behavior of the consumer when making a decision is often influenced by irrationality. Furthermore, expressing the notion that, while making decisions, the rational basis for decision-making is significantly limited by three major influential factors: the limited amount of time they have to make a decision, the limited information available and cognitive limitations of the very person.
- 5) *Denial of loss* – refers to the refusal in the acceptance of knowing statistical odds.
- 6) *Disposition Effect* - the effect influences the decision-making of the consumers by perceived loss and gains and engagement in irrational investment behavior. We will elaborate on this in further subchapters.

5.2.2 Observations in Behavioral Economics

5.2.2.1. *The fear of loss vs. excitement to gain*

With the buying of a product, customers do realize the likelihood of meeting unexpected, or unwanted losses. A common observation in studies suggest that fear of losing, or wasting money, is often greater than the excitement to gain things that are of relatively reduced significance. Additionally, accepting a bad buying decision is even more difficult.

Kahneman and Tversky, great influencers in behavioral economics and finance, presented an idea that is called prospect theory in the year 1979. This concept argues that individuals generally value achievements and failures in dissimilar processes, even when a person has a similar economical outcome. On the other hand, the prospect theory proposes that the loss has more psychological impact on human beings generally, than a similar quantity of gain.

Prospect theory in particular, is gaining positive momentum in research and academics by taking into consideration the psychological factors as an input in decision-making and financial analysis. This theory has also witnessed emerging practical applications in the U.S. and Europe.






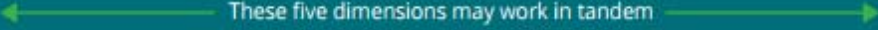
|  Outcomes valuation |  Calculation bias |  Timing elements |  Environmental influences |  Choice architecture |
|--|---|---|---|--|
| <ul style="list-style-type: none"> • Loss aversion • Mental accounting • Prospect theory • Certainty/possible • Status quo bias • Sunk cost fallacy • Zero price effect | <ul style="list-style-type: none"> • Affect heuristic • Anchoring • Availability • Halo effect • Optimism bias • Representative | <ul style="list-style-type: none"> • Empathy gap • Hedonic adaptation • Hindsight bias • Peak-end rule • Diversification bias • Present bias • Projection bias • Time discounting | <ul style="list-style-type: none"> • Game theory • Herd behavior • Commitment • Inequity aversion • Reciprocity • Social proof • Saliency • Priming | <ul style="list-style-type: none"> • Decoy effect • Default options • Choice overload • Framing effect • Partitioning |
|  These five dimensions may work in tandem | | | | |

Figure 4: Behavioral strategy to combat choice overload. [7]

5.2.2.2. *Mental Accounting*

The decision-making process is also influenced by relationships and experiences from previous service providers and investments. A company which provides the customer with good service and brings the greatest profit, tends to be the favorable choice of the customer. Therefore, the need to stay loyal often impacts the decision.

Interestingly, the source of finance also influences the decision making. People often differentiate their hard-earned money from inherited money and make irrational decisions in terms to hold on to inherent stocks. Their psychology compels them to believe that different sources create a different purpose regarding money while, logically, money is interchangeably only a term for currency. Therefore, sometimes people tend to make separate decisions which were meant to be combined.

5.2.2.3 Heuristics

Heuristics refers to the systemic approach used for overcoming difficulties and by this serving the immediate goals in any given decision-making process. Essentially, these are mental short-cuts to focus on one aspect at a time and ignore the others. Heuristics makes the decision-making procession easier. “From the fast as well as economical perspective, the introduction of heuristics seems to be the “ecologically rational” making superior usage of inadequate information that is accessible to people”^[8]. The affect, availability, and representativeness, as different domains in heuristics hold general purpose character. “The other more specific domains of heuristics include brand, price, and scarcity heuristics which are more developed field in social and consumer psychology”^[9].

Brand Heuristics

Brand and price is a powerful framework for decision making in buying processes. The majority of customers tend to go for well-known brands. It is fast, and easy to use heuristics when a customer has no prior personal experience in car-buying. In such cases, the customers are likely to choose the familiar brand name as those brands seem to be of high quality owing to its popularity.

Price Heuristics

Price heuristics, similarly, is an approach that is applied to scenarios of service composition for high-efficiency optimization^[10]. Many people tend to assess a product by taking the price as a guide, believing that expensive products are likely to be of a higher quality in comparison to something cheaper. However, although logically price is often a fair guide, it is not something to ultimately rely on in firm decision making.

Security Heuristics

Similarly, there is another approach called Scarcity heuristics which suggests that if something is rare or scarce, then it is a better, more desirable, choice. Scarcity heuristic leads to us to make biased decisions on a daily basis^[11]. Whenever a person evaluates the four basic parameters such as quantity, time, rarity, as well as censorship, they normally become bias by this heuristic.

Whenever decisions need to be made in a timely manner, heuristics is undertaken. A set of rules of thumbs in heuristic, including intelligent and introspective guess work, trial and error, part experiences and formulas, helps in faster and simpler decision-making. However, it may also lead to biases. These biases are even more prevalent when scenarios and choices are changed with time and place. This may result in decisions which are not entirely rational.

5.2.2.4 Disposition effects

The concept of the disposition effect was first derived from the financial literature of Shefrin and Statman in the middle of 1980s^[12]. Prospect theory provides a standard explanation for the disposition theory and is based on Kahneman and Tversky's loss aversion framework^[13]. This theory suggests that evaluation of gain and losses is based on the buying price that acts as reference point of apparent gain or loss. A study conducted by Goetzmann and Massa in 2003 suggests, "disposition has an effect on the individual security level and simultaneously has an influence on the collective level also as it appears to work on disposition-prone buyers to affect at the market-wide level"^[14].

The cross-sectional differences in daily returns and transactions that control the individual characteristics, or other factors, can be explained by analysis of exposure of the consumer to a disposition factor. There have been evident instances that support the hypothesis of how the trade between different parties, and their disposition-prone customers affects the relative prices of a product.

"The disposition effects also refer to preferences, including the idea that customers tend to seek pride and want to avoid regrets when making a choice in buying a product"^[15]. Recently, Muermann and Volkman (2006) argued that the disposition effect cannot be explained alone by loss aversion and also incorporates the prediction of regret, as well as satisfaction, in the setting of a vibrant portfolio. Regret can be defined as a feeling associated with the knowledge that the decision which was made, fared worse than a potential alternative. Pride can be defined as the positive counterpart, a feeling associated with the knowledge that the decision that was made, fared better than a potential alternative. In the setting of this disposition effect, whenever a loss takes place - and then is recognized/realize by the effected person - this very person reacts with disappointment.

5.2.2.5 Framing

Framing refers to the concept of presenting choices to the consumers, and how it affects their decision-making process. Therefore, if the way a problem is presented is changed, that is likely to result in a different choice being made.

Framing is a widely used method for choice architecture that refers to the consideration of every aspect of how choice environment influences the choices we make. Choice architecture is the practice to design different ways of presenting choices to consumers to 'nudge' them to make better decision. Besides framing, providing default and decoy options also helps in choice architecture for the consumers. In this way, choice architecture helps the consumer to make better decisions and thus contribute to consumer welfare.

Interestingly, based on whether an individual emphasizes on process of thought or process of interpersonal communication, framing can be achieved in two of these ways. Framing in communication can be interpreted both in positive or negative ways due to reference-dependent perceptions and is individualistic in nature. For instance, rhetorical packaging of a product can be pleasant to one but discouraging to other. Additionally, framing can make individuals behave in risk-averse ways when presented with a gain perspective, but risk-lovers when presenting the losses. "The likelihood of recalling information is dependent on the severity of potential injury and the perceived seriousness of the outcome. This considerably influences the information on risk-taking and its consequences"^[16]. "Therefore, framing the information in a way that is relevant to their situations and circumstances plays an important role in influencing the choice the consumers make"^[17].

5.2.2.6 Market inefficiencies

Modern financial theory laid one of its foundations on efficient market hypothesis. However, this hypothesis does not consider irrationality in people's decision-making process. There are many examples demonstrating how human psychology influences the rational investors who are driven by fear and greed in 'informationally-efficient' markets. The investors are frequently caught by greed and try to acquire as much money as possible. Choices influenced by greed are commonly observed in stock market or 'frenzy offers', provided by many companies in big sales.

Greed is less imperative to see while making long-term investments like buying a car. Fear of making wrong decisions, however, is very common in car purchases.

Anomalies in the market are related to the rate of return and prices that are distorted and often influenced by factors such as unfair competition, lack of transparency and regulatory deficits. They also encompass the behavioral biases through the economic agents. Other related anomalies include the calendar effects including the January effect.

The economic calendar events are very crucial in many markets and particularly the automotive industry. Deeper understanding of date or season driven economic events may guide the OEMs in understanding the clients' needs at a particular time within the year.

Ultimately, behavioral economics have a strong relevance in terms of understanding the decision-making factors of customers in general and, specifically, the automotive customers. Not only are the trigger points of decision-making processes relevant for the OEMs to know, understand, and utilize, behavioral economics also help marketers to place their products in the appropriate channels, at the appropriate time, and in the appropriate way.

As an integral part of the deeper understanding of automotive customers, behavioral economics also helps build stronger relationships with customers by allowing an insight into the factors that determine the choice they make. While customers have certain needs whilst in the decision-making journey, they also have immediate active goals. These active goals influence what information is being paid attention to by customers. Thus, understanding the consumer decision journey by applying behavioral economics can help the automakers to have a relatively fixed and stable choice over time. This will help to understand how consumer preferences can be influenced across a spectrum of choices in the consumer decision cycle to maximize the impact over the purchase decisions.

Chapter 6: The Consumer decision journey (Schmidt)

6.1 Introduction

As a next step in our model, we intend to expand on how and when decisions (in general, as well as specifically when buying a car) are triggered, initiated and executed in the customers mind. Built on the previously researched field of behavioral economics it should allow a deeper understanding of these very moments in the buying process, when the consumer reaches a decisive point in their choice journey, ultimately leading to buying, or not buying a product. It is these moments and touch points marketing which has always sought, when consumers are open to influence and a brand is able to capture them in a highly predictive and cost-effective way.

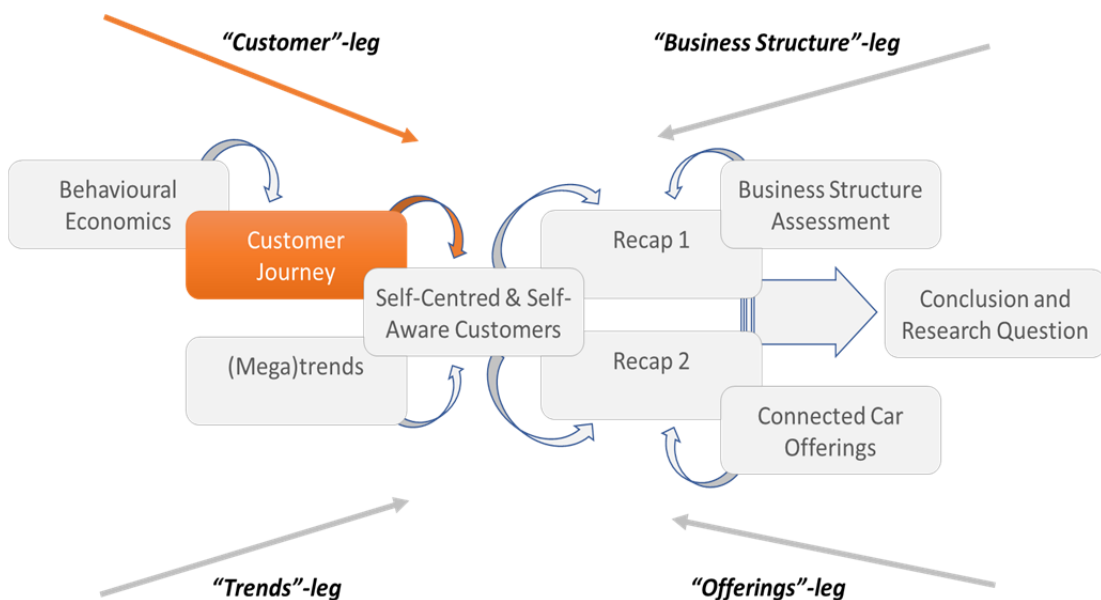


Figure 5: Influence Model – Customer Journey

6.2. The Consumer Funnel

The consumer decision journey was traditionally explained by using the 'funnel' metaphor that directs one-way conversations and ignores the variable paths that consumers follow to purchase an item. Previously, customers had to go through the traditional funnel framework, but now they constantly, and intriguingly, keep interacting with their friends and peers to engage with different brands.

This makes the decision process more complicated and influenced by multiple non-unidirectional parameters. Unlike the traditional purchase which funnel framework suggests, the consumer decision journey, as explained by McKinsey, focuses on the current decision path in the purchase journey and then communicating with the utmost relevance at a given time. This allows the customer to interact with the product providers throughout the process and build stronger, long-term relationships. This considers not only being engaged with the customers before buying the products, but also ensures providing excellent services in post-purchase experiences as well. While making long-term investments, as in automobiles, delivering effective messages at the right time and place, certainly leaves a lasting impact.

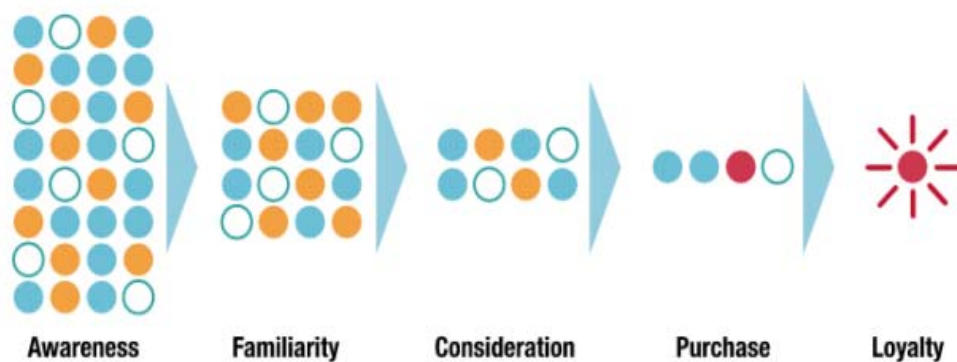


Figure 6: Traditional consumer funnel. ^[18]

Instead of being a linear funnel, the new consumer decision making journey can be considered as a system of loops within a loop. All factors are interdependent and somewhere related to each other, thus collectively influencing the purchase decision in the automobile sector by the customers. In this way, maintaining a loyalty circle has an important role to play for enhancing the reputation a company.

The process of decision making is a journey with four major phases which illustrate the potential battle grounds where marketers may have a chance to meet their customers. The marketers must provide customers with ways in which they can understand the respective products better, and also understand their strengths and weaknesses. Providing all information to the clients enables them to make sound judgments, thus making potential business more successful.

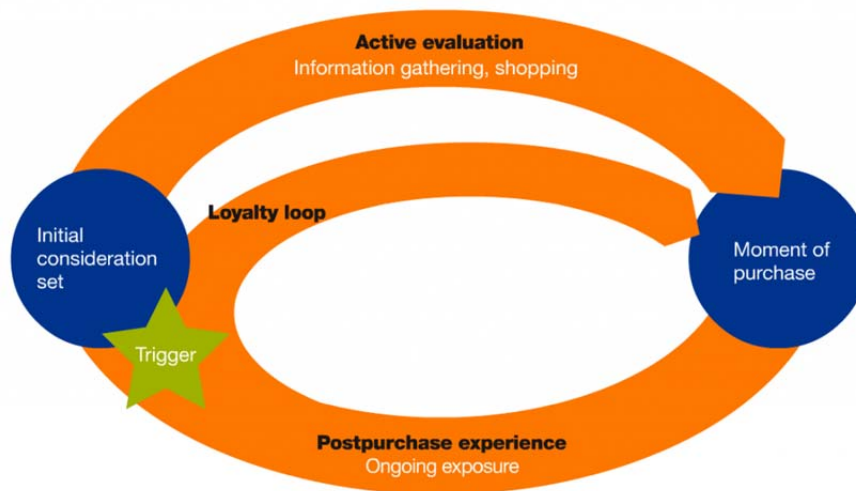


Figure 7: Consumer Decision Journey. ^[18]

6.3 Consumer's Decision-making factors

The emergence of numerous channels in online communication through web including micro-blogs, review & compare websites, and social networks have caused fundamental changes in the consumer decision making process.

An interactive social experience significantly influences the commerce when taking considerable purchasing decisions. Clearly summarized in the study by Griskevicius and Kenrick, "the fundamental objectives for buying an automobile incorporate:

1. Evasion of physical harm
2. evading diseases
3. building friendships with new people
4. achieving status
5. get a companion
6. hold the companion, and
7. taking care for family"^[19] .

Note that these objectives should not be confused with the decision-making factors of buying a specific car model or brand. (Chapter 11.3 – The Power of Buyers)

When regarding automobiles, human behavior has potential relevance while making a purchase decision. Considerable attention is paid to anxieties, which permeate the automotive system on a wide range of levels and have received limited attention in the literature so far.

Often an argument is put forward that anxieties have great relevance for attachment to a car because they address fundamental needs of the consumers for necessitating car travel. "These needs include obesity, old age, and insecurity in outside world, all of which require auto-mobility" ^[20].

However, in today's world, the customers are not purely focused on purchasing automobiles for commutation. Automotive players that still focus on sheer hardware manufacture have not yet gained sufficient understanding of the consumers' decision-making process. The basic leadership process is currently a roundabout adventure with four stages:

1. beginning thought;
2. dynamic assessment, or the way toward inquiring about potential purchase;
3. conclusion, when buyers buy brands; and
4. after purchase, when buyers encounter them ^[21].

There are appropriate sets of assumptions and considerations to be considered to analyze the plausible range of socio-technical, imaginary desirable options available to the customers as well. Companies are required to identify and recognize the specific needs and demands of the customers to direct, and guide them through, which they can relate to the product and associated services. A recent study this year by Wang and Chiahui suggests that, "positive and negative valence WOM (Word of Mouth) and WOM content along with observation of other consumers' purchases significantly show impact on consumers' intention to purchase a product, therefore enhancing the probability of actually purchasing and sharing the data of a given product with their peers and other people on social commerce sites" ^[22].

With regards to the potential purchase of a car, the service component plays a significant role too. This necessitates an efficient and proper management of 'The Product-Service System (PSS)'. An elaborated PSS understanding can help companies to reach their customer by making developments in the required aspects of the products and services, exactly targeting the fields where the consumers ask for improvements; thus making a particular car a preferred choice to consumers by considering its obvious advantages over other related automobiles, not only from the perspective of convenient commutation but also from taking into account all related incentives, services, and the product itself.

6.4 Rational/Irrational Decision-making process

When considering automobile purchase, there are both rational and irrational approaches that affect the decision-making processes.

An understanding of modern psychology provides a good insight into the full purchase decisions taken by customers. According to "Drivers and Outcomes of Brand Heritage: Consumers' Perception of Heritage Brands in the Automotive Industry," by authors Klaus-Peter Wiedmann et al, consumers preferences of vehicle brands coincide with the histories of credibility and reliability. Therefore, the need and relevance of targeted sections of the market are of supreme importance.

There are two broad fields of motivations while making purchase decisions in automobiles:

- The first is *hedonic motivation* that involves fulfillment of certain positive emotions, for example, confidence and interest. This kind of decision makers intend to raise their social status. The considerations of hedonic motivators in the decision making of buying an automobile are usually speed, price, reputation and style of the cars. Among the categories that these customers are interested most, are sports cars.
- The second kind of motivational factors in the purchase process are the ones that serve the *utilitarian purposes* of the cars. These kinds of considerations prioritize the convenience, mileage, space, emissions, safety and other aspects of the cars. The major focus of these consumers are prevention goals, and environmentalism.

A study conducted by Chitturi suggests that "these utilitarian and hedonic considerations are reflected in the individual personalities and behaviors of the car owners. Therefore, people who buy luxury cars are more inclined towards social status and material wealth, whereas more utilitarian vehicles are preferred more by necessity of consumers' lifestyles"^[23].

The demographics and their preferences are also influenced by the geographical regions, and the status of country's economy. In larger markets, such as India and China, several other considerations need to be followed. In these markets, where there are scopes of increased consumer demands in the future, network expansion should be one of the foremost priorities dealing with the customers' needs.

Moreover, brand heritage plays a vital role in adding to this perceived validity as well as the reliability of a certain brand by providing positive connotations and image hence influencing the purchase decision-making of potential customers. A brand with a heritage tends to create more expectations about future behavior making promises that the brand will continue to be honest, caring and confirm to deliver on these commitments. ^{[24][25]} Therefore, by reducing the consumer buying risks and services-perceived values, the brand construction significantly impacts the choices of the consumers. "Brand construction can be defined as the meaning as well as the manufacturing activity of the buyers that ultimately results in forming the basis of brand value". ^[26]

The general aim of branding is to build a positive connotation and experience for a targeted customer segment. However, this is done in a sophisticated way by touching on the material and sensory level of a customer, thereby influencing him in a "subconscious" manner. Moreover, branding is never a one directional process, since the customer himself has a high influence on the perception, and perceived value of a brand. Branding is generally aimed to shape the consumer's experience, usually through an intervention on a material and sensory level in ways of which the consumer may not always be consciously aware.

OEMs are accordingly differentiating themselves in terms of brand reputation and service. A firm focus on market leadership and brand management is thus crucial for market differentiation and building long-term relationships with the customer.

At the same time, OEMs must be in a position to ensure that their customers are engaged at all time in order for them to maintain positive customer relations. These kinds of relations will make their customers build trust in them, as they then do not solely focus their decision-making on the product, but additionally on intangible factors like e.g. brand experience.

6.5 Change of purchasing behavior induced by digital technology

Here we will elaborate on the changed purchasing patterns and behavior induced by the hyper-accelerated utilization of digital technology. Coming from previous generations (baby boomers and Generation X) we will take a special focus on the

generation born after 1995 (= digital natives/Generation Y and Z) and their - as we believe - disruptive way of purchasing compared to previous generations.

Consumers are now intriguingly engaged in digital interactions and the evaluation of the array of choices available. The interactions with the service provider remain, even after the purchase, through social websites. This new trend and ideology has compelled the companies to rethink their production and marketing strategies. Successful companies tend to target each stage of the Consumer Decision Journey with an appropriate and effective marketing strategy along with the development of, 'Customer Experience Plans' to make sure that the message is unified, consistent and relevant at all touch points.

Chapter 7: Megatrends in the automotive industry (Schmidt)

7.1 Introduction

Understanding the influence of (Mega)trends has been a clear imperative to identifying the dynamics of a target group of customers. Therefore, we chose to take a closer look at these trends supporting the second leg of our model, and now further fostering our understanding of the customer and his decision-making processes. In general, several mega trends are influencing industries and economies on a global level. However, some of those influential factors especially apply for the automotive markets. By highlighting the most important ones, we intend to explain certain external drivers that we believe are of major importance in order to properly assess this industry's current and future potential.

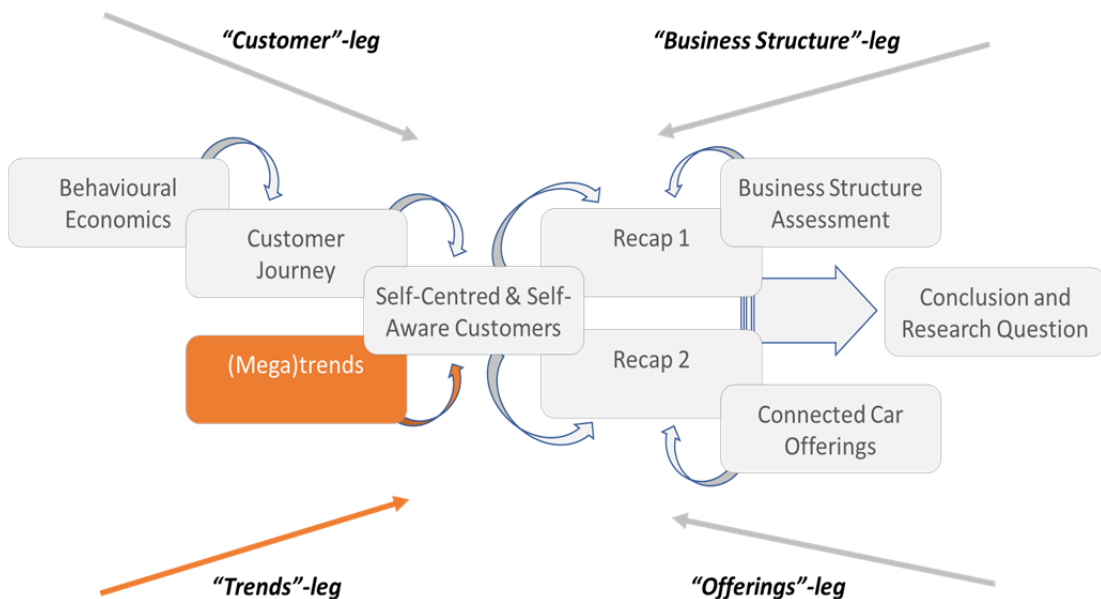


Figure 8: Influence Model – Trends-leg

With the advent of globalization and increasing competition, the automotive industry is pressing new challenges to enter a period of widespread and transformative change. A range of factors, which impact revenue, cost and profits influenced by government regulation and upcoming diverse trends, are increasing the complexity of economic options available to the automobile manufactures.

Many of these factors exhibit firm interdependencies and show interconnectedness with one another. Therefore, for mature companies to remain in power and in emerging markets to seize the opportunities, the industry should adapt to the turbulent transformations which are taking place in the automobility sector.

7.2 General trends

In this period of tremendous change, OEMs cannot rely on their traditional toolbox. Therefore, to tackle the emerging risks and find growth and profit in the future, proper review and adjustment in strategic priorities will help them to strengthen their value chains and exhibit flexibility to address future profitability. In order to develop new skills in accordance with the global automotive industry, the following can be the areas to find opportunities to mitigate risks:

1. Economic and Demographic shifts

As an effect of liberalization, national markets are tending to become globalized. However, the OEMs are required to change according to the regional and segment markets to avail the growth opportunities offered by this emerging market. The total number of car sales in the European market depends on the level of expansion as well as employment generation of those nations. Some predictions indicate that there can be static future auto-mobility allowing for no significant expansions. Hence, the new developing markets are expected to show dramatic expansion outside of Europe. "These market segments include countries like China, South America and India. By 2020, there will be rise in share of global sales from emerging markets by 10% from 50% in 2012 to 60% in coming years".^[27]

They are potential areas for major expansion of the market. However, this may need change in the alignment of production priorities according to the geographic regions and its economy's status. Thus, the demands outside Europe are diverse and variable owing to differences in their economic cycles and legislative differences.

In yesteryears, the economic power continuously moved from emerged economies, to emerging ones. If this tendency continues, the automotive industry must assess and re-assess its strategies in order to best tackle these markets and customers. In response, the automotive industries will be required to make amendments and encourage diversification of their portfolios to keep up with the demographics' shifts and their demands^[28]. With the increased regulatory concerns regarding environmental and safety standards, the OEMS will focus on low emission vehicles (Hybrids, EVs). Therefore, "Greening" will be encouraged and become quite compulsory, which will further cause the OEMs to invest in highly connected energy efficient, low emission, low environmental impact (hybrid and electrical) vehicles. Therefore, OEMs will make greater investments in e-mobility such as hybrid and electrical power-trains and even battery cars. To push the general acceptance of connected technologies and cars even further into the market, OEMs could make alliances with car sharing companies and fleet customers showcasing these vehicles on a broad and easily accessible basis.

2. Urbanization

Since the 1950s, there have been increases in urban dwelling from 30% to 50%. This is expected to further increase by 10% within the next decade. Therefore, urbanization will significantly influence the size of the vehicles. "Smaller vehicles including subcompacts and super-mini cars will provide a major growth opportunity in the market to the automotive industry. The expected reach of these smaller vehicles is estimated to be more than 30 million in 2020"^[29]. Thus, it will provide OEMs scope for large share of growth by a few focused adjustments in the footprints. However, due to emerging market players, this market segment will face intense competition.

3. Climate Change and resource Scarcity

Governments are implementing tighter environmental regulations focusing on the preservation of current resources and environmental compatibility. As a result, OEMS will have to manufacture a variety of cleaner, safer and low-to-

zero-emission vehicles. At the same time, the regulatory pressures on the established markets will tighten adding to the costs of average vehicles.

4. Technological breakthroughs

With the advances in connected technology, the industry is about to witness real time monitoring of driving performance, advanced car infotainment, and electric vehicle integration. Major breakthroughs in frontier research and development are offering new opportunities as a result of more involvement of fields that range from nanotechnology, artificial intelligence, augmented reality, to robotics in auto-mobility business, by challenging the traditional industry limits and focus on hyper-personalization.

7.3 Major Disruptive trends

Looking at the megatrends mentioned above, there have been emergences of revolutionary new business models because of digitization and increasing automation. In the automotive sector, these forces have given rise to disruptive technology trends through means of diversified mobility, autonomous driving, increased connectivity and electrification. These four trends will be acting as reinforcement and acceleration for one another, ripening the disruption so observed. However, the growth potential and relevance is highly dependent on the OEM's ability to meet the future customer's expectations.

1. Expansion of automotive revenue pools via connected technology

The market will be witnessing a significant rise and diversification in data-driven services and on-demand mobility services creating 30% increased additional revenue potential around the year 2030. This is driven by emerging trends in shared mobility, increased connectivity and potential upgrades in the basic features of auto-mobility. Shared mobility will be obtaining revenue in the form of car sharing, e-hailing and other recent trends. Similarly, various connected applications, software upgrades and remote services will contribute significantly in these revenue pools as attributes of data-connectivity services.

In this way, connectivity will allow future cars to act as platforms for manufacturers to exhibit their capabilities in digital innovation, and upgradable software-based systems. Besides, the constant awareness of consumers in technological advancements will keep up the demand in the upgradability in cars.

High-disruption scenario, \$ billion

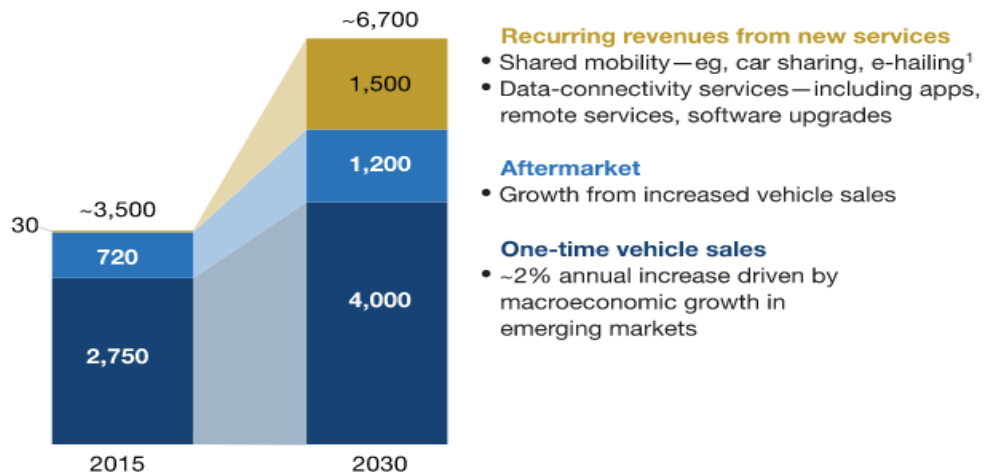


Figure 9: High-disruption model automotive revenue pool development via connected technology. ^[30]

2. Shift of Economies

The industry will continue to experience growth in overall car sales, but there will be a significant chance of a drop in annual growth rate from 3.6% in previous years to about 2% by 2030. Driven by macroeconomic factors and shift of major economic factors to emerging markets - than already developed sectors - there will be an increase in the market demands to cause overall positive macroeconomic development with the rise in middle class consumers at the global level. However, this may result in decreased demands and sales of private-vehicles and will remain a driver for revenue generation from high utilization automobiles.

3. Change in consumer mobility behavior

Change in consumer preferences, tighter regulations and further advancements and breakthroughs in connected technology will cause a shift in the mobility behavior of the individuals. The traditional business case will thus need complementing their product with on-demand mobility solutions keeping up with the increase in density of urban environment. When asked in a recent IBM study, sixty-nine percent of the executives cited such new services as a top way to grow. OEMs vastly own all vehicle-centric services. However, the entire span of convenience- and (content rich) user experience related features and services are out of their hands, without mentioning the majority of connected technology implemented in modern cars and the data harvesting models behind them. All these will see a high increase in demand and, potentially, enabling new entrants owning these technologies to enter the market. At the same time, alternative mobility services like car sharing may cannibalize traditional business models (e.g. car ownership).

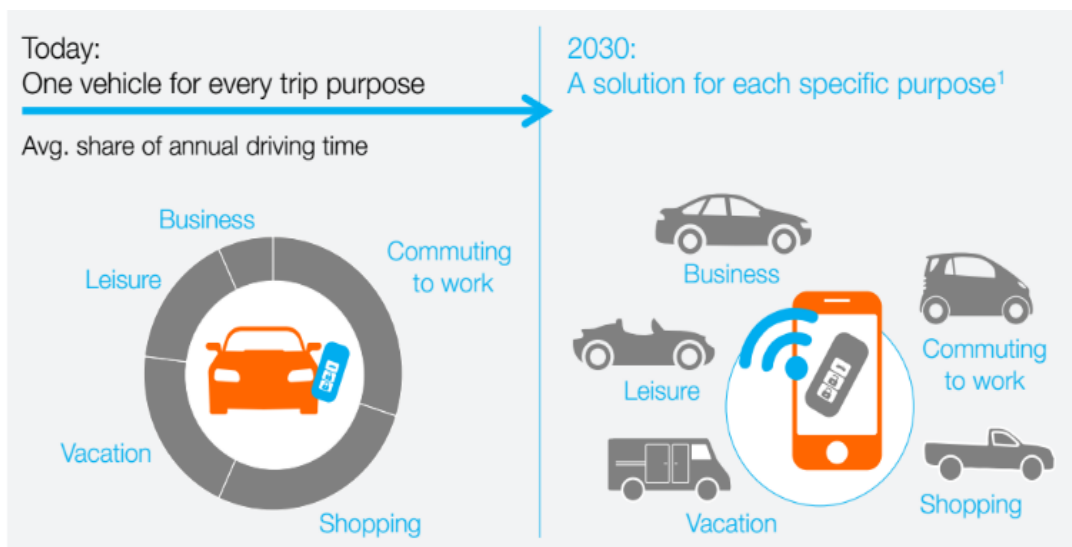


Figure 10: Automotive revolution perspective towards 2030. ^[31]

4. Market segmentation

The fragmentation of the consumers based on the geographical region and the country will be a major consideration for the automotive industry in the future to avail the opportunities provided by the emerging segments of the market.

The different dimensions of this segmentation hence are essential elements to understand the relevance of mobility behavior. Based on the population density, economic status, and prosperity of these markets, the automotive industry will need to analyze scenarios in order to make the availability of new business models in accordance with consumer preferences.

Know what consumer wants

Owing to the new trends and preferences, consumers expect and want to experience seamless and safe driving with omni-channel interactions. This indicates the change in relationship between the OEMs and the customer. Generally, the consumer experiences are intuitive and relevant to the information about the enterprises, but the scenario has changed. Consumers now try to seek information from all the available channels, thus expecting the enterprises to know their demands and preferences. The relevance of the services and car features will be a priority of the future consumers and as a result, they will tend to make more rational choices. This change in lifestyles and emerging advances in digital technologies are creating new expectations arising in consumers about the idea and purpose of owning a vehicle.

Want what consumer knows

Simply relying on the knowledge of consumers' trending preferences and changing lifestyles will not be enough to remain in the industry. Forward-thinking by the companies will be required to materialize their plans. Fortunately, understanding an of ways to cope with the transformation in consumers' demands and engagement will help in profitable revenue generation in the coming years. With a number of channels to gather as much information as available, the consumers will significantly impact the manufacturing sector by directly interacting in various aspects of company offerings and product creation. Therefore, sectors like mobility services, product designing and marketing programs will be expected to be influenced by consumers' involvement. The crowd, which refers to an informal and ad-hoc grouping of people, will be empowered to bring about additional insights. They will thus work collaboratively within a multiple engagement system and models implemented by the automotive industry.

As a result, the enterprises tend to get an opportunity to exploit the 'power of crowd' by taking advantage in consumer experiences by means of games, contests, and other approaches to encourage consumer participation that is expected to positively influence the consumer-provider relationship by meeting their demands.

As in any other industry, digitization has also driven innovative developments in the automotive industry. Thorough research undertaken by Ernst and Young has shown that there are four major patterns. These four patterns are vastly deterministic of the future demands and versatility of the automotive industry and may provide insights in what could enable the industry players to design better plans to cope with the rising instability in their markets:

1. "The income pool related to the wider transportation business is expected to further grow towards on-demand mobility as well as towards information driven administrations and predicted to make up to approximately USD 1.5 trillion, translating into a 30 percent raise in potential revenue in 2030 and about USD 5.2 trillion from customary auto deals and the reseller's exchange items or administrations, up by 50 percent from about USD 3.5 trillion of 2013" ^[32].
2. Regardless of a move toward shared versatility, vehicle unit deals will keep on growing, however likely at a lower rate for each year. The auto deals globally will continue to grow. However, the yearly development rate will tend to drop to around 2 per cent by 2030. The major factor contributing to this drop will be from macroeconomics elements and rise of portability administrations, including auto-sharing and e-hailing. A number of geographic regions, including many parts of Europe and North America, will be potential profile sets for such portability administrations. As a result, there may be a fall in the private-vehicles deals which are expected to be counterbalanced by these shared-mobility vehicles ^[33].

3. Customer versatility conduct is changing, prompting up to one out of ten autos sold in 2030 conceivably being a mutual vehicle, and the consequent ascent of a business opportunity for fit-for-reason portability arrangements.

Change in customer inclinations and forward mechanical leaps tend to play a central move in singular portability conduct. Presently, people utilize many methods of transportation to finish their voyage. In accordance to this, the auto deals will need customary plans supplemented by scope of on-request portability arrangements especially in areas with growing urbanization.

4. Through constant enhancements in battery innovation and cost, those neighborhood contrasts will turn out to be less articulated, and energized vehicles are relied upon to acquire a bigger share of the overall industry from customary vehicles. With battery costs possibly diminishing to between \$150 and \$200 per kilowatt hour throughout the following decade, jolted vehicles will accomplish cost aggressiveness with customary vehicles, making the most noteworthy impetus for advertise infiltration. In the meantime, it is imperative to note that zapped vehicles incorporate an expansive segment of cross breed electrics, which implies that even past 2030, the interior ignition motor will stay exceptionally significant ^[34].

7.4 Adapting to the SELF area

With the rise in connected technology and digitization in the automotive industry and its growing integration with the products, the industry is moving towards more personalized and customized vehicles. The consumer will tend to undergo a more individualized experience as the industry will exploit their predictive preferences to shape opportunities. Social and digital footprint, with the introduction of new services along with the ecosystem of the consumer, will make the car an integral part of the consumer's lifestyle.

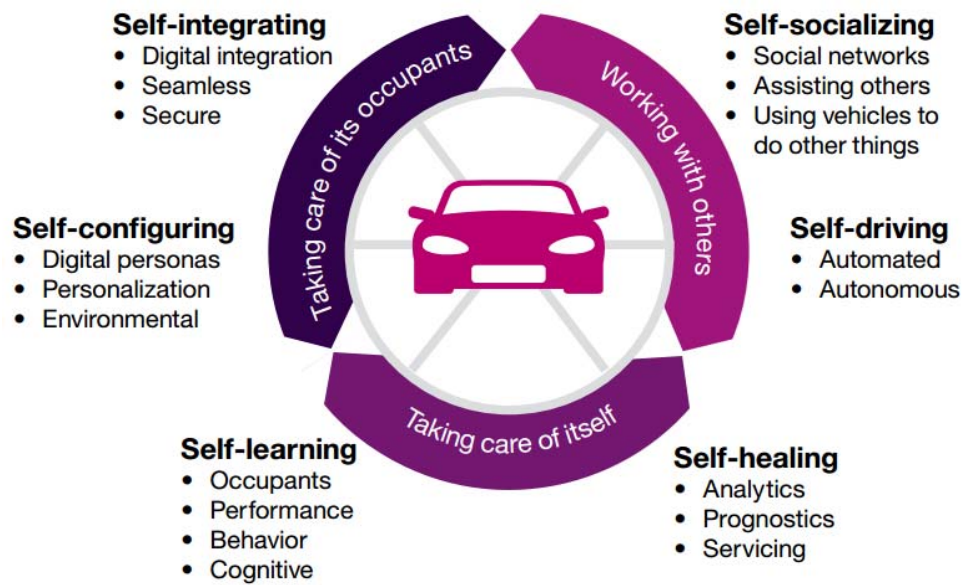


Figure 11: IBM SELF-trends. ^[35]

A comprehensive study by IBM has described the multitude of a number of disruptive SELF trends:

Self-enabling vehicles

By the year 2025, vehicles will tend to be able to learn, heal, socialize, and drive autonomously. Thus, these future vehicles are expected to become more sophisticated and self-configuring as they will adopt features making them aware of other vehicles and the surrounding environment.

Self-integrating

Vehicles will become an important component in the Internet of things (IoT) making it smarter than ever. It will be able to gather and use information about traffic, its mobility, weather, and other details regarding driving conditions. Thus, cars and other vehicles will become more location and sensor-based.

Self-configuring

As the vehicles will provide more individualistic mobility experiences, they will have significantly more sophisticated digital information as per personal preferences of the consumers, including configuration of controls and seats, preferences in multi-media informative, and secure purchases in financial transactions or medical information. Additional and more specific configurations will also be favored. For instance, heart patients will tend to experience safer commutation as companies will provide vital monitoring vehicle alerts to sense a potential heart attack and thus slow down the car. Similarly, according to the medical information, appropriate health facilities will be provided.

Self-learning

Vehicles will have cognitive capabilities to understand and learn the behavior and demands of its driver and the vehicle itself, whilst displaying expansion in mobility service options by means of actually optimizing and advising the mobility, according to the surrounding environment.

Self-Healing

With the numerous smart technologies emerging in the coming years, the vehicle will be more and more able to fix itself without intervention of human hands. These vehicles will be enriched with enough analytical capabilities to identify and optimize their issues, keeping utilization and availability at a much higher level than historically experienced.

Self-driving

Autonomous vehicles have already made their place in the market and likely experience a further increase in demand in coming years. It will actively act as an additional key consumer differentiator.

Self-socializing

The social networks in the vehicles will provide the feature of connecting the vehicle with other vehicles. This will extend the scope of cars beyond mobility by sharing information and solutions by socializing with other vehicles as well as industries.

Consumer-Driven Mobility

Consumer-driven mobility offers numerous opportunities to adapt to new business models. Thus, new trends like car-sharing will make the consumer compel companies to transcend the traditional vehicle-centric focus and instead demand more consumer-centric services in accordance with their preferences and lifestyles, including driver convenient comprehensive in-vehicle content offerings, and platform related seamless experience.

7.5 New Mobility Services (NMS) influencing the automotive industry

Car ownership models are numerous in types. Based on technological advancements and shifted customer expectations as well as related change in general mobility behavior these models are currently undergoing a transformational change. Compared to traditional means of transportation, any of these so-called NMS' are services that are perceived to be more reliable, capable, and suitable to modern consumers' needs as well as easily available and connected; all adding value to future mobility expectations.

NMS, such as ride hailing and car sharing, also contribute to reduced demand for parking, pollution, and congestion, as well as providing energy savings and saving transportation costs for users. Each of these NMS fits a specific niche, but they also partially overlap with one another and with established means of transportation.

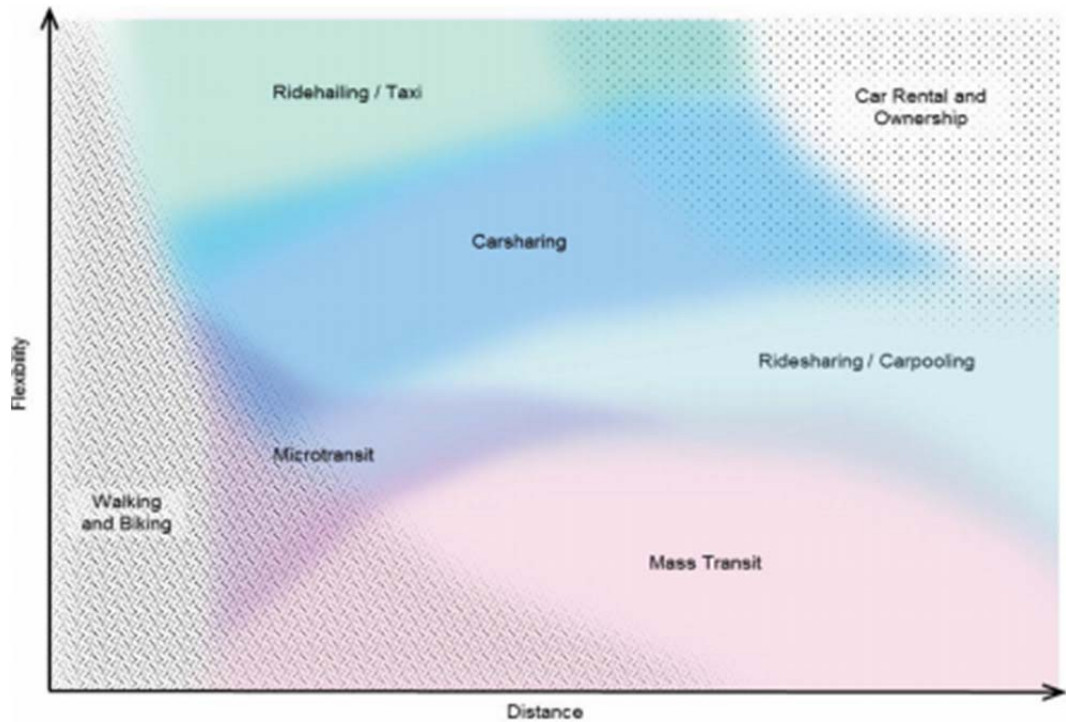


Figure 12: Ideal use cases for different modes of transportation. [36]

Ride-Hailing

Ride-hailing services make use of smartphone applications to build financial connection between the offering partner, and the service receiving partner. Transportation Network Companies (TNCs) are engaged in the designing and operating of these online platforms via applications in which paying passengers can connect with their self-employed drivers. The biggest TNC right now is Uber (present on all continents), followed by regional players such as Lyft (United States), Didi (China), Ola (India), Haxi (Europe), and Gett (Europe). A variety of operating models have been launched by TNCs, along with several other services which provide the option of sharing a ride with others - known as 'ride-splitting' - such as UberPOOL, and UberHOP by Uber, and Lyftline by Lyft. Simultaneously,

TNCs have also been experimenting with actual ridesharing services (for example, UberCOMMUTE, Uber's Destinations feature, Lyft Driver Destination, Lyft Carpool) that allow drivers to input their destinations and then accept ride requests from people wanting to go along the same route as the driver.

Ride-sharing

Ride-sharing is a form of car-pooling that makes use of private vehicles for commutation arranged as shared trips on short notice between people who have a common destination. Europe is the biggest market for ridesharing with BlaBlaCar being the largest operator providing a long-distance ridesharing platform in Europe and South America. Travelers share trip costs through these ridesharing platforms which charge a fee for making the connection.

Car-sharing

Car-sharing refers to a short-term car rental, usually by the hour. Several types and models for car-sharing have come into existence since its introduction including round-trip car-sharing, Peer to Peer (P2P), business car sharing, free-floating car-sharing, and station-based car-sharing. Car-sharing is available in 26 countries spread across North and South America, Europe, Asia, and Oceania. The biggest car-sharing market is Europe, home to more than two million members and nearly 60,000 vehicles in service in 2014.

Microtransit

Micro-transit refers to a wide range of private transit services by making use of buses. The schedules and routes are flexible based on the customers' demands. This transit system which resembles current route-deviation services serves as a bridging the gap between single-user transportation and fixed-route public transit. Furthermore, the comprehensible information related to mobility patterns of consumers and the broad smartphone availability have made comfortable, on-demand transportation more convenient for the users and more profitable for providers.

Mobility-as-a-Service (MaaS)

MaaS refers to a mobility distribution model to provide end-to-end transportation by linking different transportation modes and making better use of the existing transportation options in a given area.

In general, a multitude of transportation options including mass transportation, sharing of automobiles, hailing of rides, etc. are merged and combined with a smartphone app solution presented to potential customers; now being able to access and pay any chosen service via their personalized, single account. In Europe, MaaS business models are comparatively more advanced due to pilot projects such as UbiGo (Sweden) and MaaS (Finland). Traditional car ownerships will be significantly reduced with the advent of new mobility like Uber and Lyft that will ensure shared mobility in coming years. Additionally, Uber, Lyft and other companies will introduce autonomous cars as soon as possible in the market.








| Service | Markets | Examples |
|---|---|---|
| Ridehailing  | More than 75 countries globally. In the United States, 650,000 driver-partners work with the two biggest operators, Uber and Lyft | Uber Lyft Didi Ola Gett |
| Ridesharing  | Europe is the primary market globally. The biggest operator, BlaBlaCar, has 25 million members across 22 European and South American countries. Limited presence in the United States. | BlaBlaCar vRide Commutr |
| Carsharing  | 26 countries in North and South America, Europe, Asia, and Oceania. 1.2 million members and 16,700 vehicles in the United States. | Zipcar Car2go Enterprise CarShare |
| Bikesharing  | Almost 1000 cities worldwide. 104 cities, 30,700 bicycles in the United States. | Motivate DecoBike Zagster |
| Microtransit  | Many development exist in Europe, where the concept was developed. In the United States, service currently is limited to six major cities. | Bridj Chariot Via |
| Mobility-as-a-Service  | Pilot projects in Europe and the United States. 70 cities in the United States and Canada have MaaS-like solutions from moovel N.A. | MaaS Global UbiGo Transloc Xerox moovel |
| Shared Autonomous Vehicles  | Technology remains in-development. Some companies are testing their technology, especially via private shuttles on campuses. | Google EasyMile Uber Ford GM |

Figure 13: Market characteristics of NMS. ^[36]

7.6 New entrants challenging traditional players

In such competition, Google is developing a self-driving prototype vehicle which has already found its way in public-road testing. Additionally, its data-based business model provides leverage to Google by innovating the operating systems and creating new automotive ecosystems – “the app car”.

The 'Android-Auto' and its highly connected likes are expected to further promote the autonomous-driving trend.

Furthermore, Apple is also working on its 'iCar' model that is supposed to be introduced in 2020. This car will have specific exteriors and UID design features. The brand appeal and heritage will give advantage to the company and thus is expected to bring revolutionary disruptive ownerships.

New companies like Apple, Google and others are indicating the disruptive ownership models enabled by the ever-growing introduction of completely connected, digitized and internet-featured vehicles in the autonomous mobility landscapes. Ridesharing services like car sharing and ride-hailing may soon represent a significant share in the future world of mobility services.

Chapter 8: Disruptive Behavior of the Millennials and Generation Z (Schmidt)

8.1 Introduction

Understanding the differences between current consumer generations and taking a special focus on the upcoming customer Generations Y (born from 1981-1996) and Z (born from 1996-2003), also referred to as the *Self-Centered* and *Self-Aware* generation, shall enable our model to create a valid picture of how to differently target certain customer segments related to their demographical behavior, brand perception, and purchasing behavior.

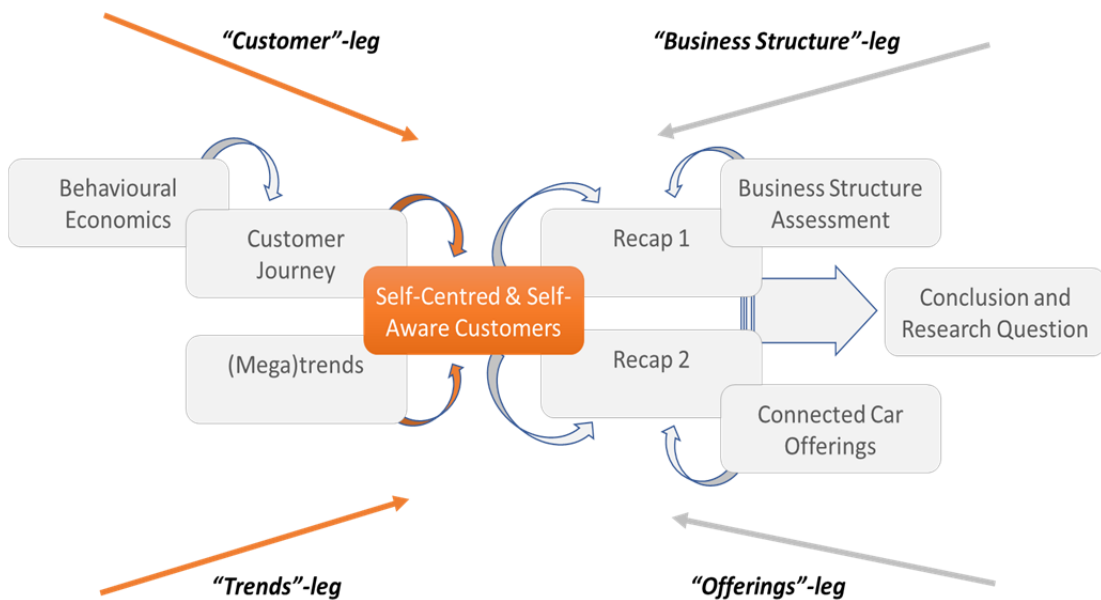


Figure 14: Influence Model – Trends & Customer-leg

8.2 Customer Generations

Generational segmentation is a very beneficial approach that helps marketers to provide a way to apply their marketing strategies by categorizing demographics in clearly segmented consumer generations. These generational theories have been categorized by time, significant events, and their influence on a particular generation in the ways they act or behave.

The first of these generations are called the Baby Boomers. They were born in the period from 1946 to 1964, and raised in times of great social change

They are experimental, individualistic, and social-cause oriented. They take advantage of brand loyalty and are more vulnerable to conventional marketing, as well as to (tactical) sales strategies.



Figure 15: Consumer generations – Shopping experience. [37]

Baby Boomers are followed by generation X. Born between 1965 and 1980; they serve as a bridge between millennials and baby boomers. They are comparatively more pessimistic. Gen Xers are generally known for dedicated, pre-structured (e.g. making shopping lists) shopping. Despite this fact, they are quite vulnerable in their shopping behavior, and thus more likely to be caught buying unnecessary goods. This generation like various types of shopping, for example, online shopping, or marketing from a store. Having grown up in an "off-line" shopping world they enjoy both: a trip to the shopping mall as well as buying goods online.



Figure 16: Millennials versus Gen Z. [38]

Millennials, or Gen Y, are referred to as technology generations, they were the first to grow up in the age of internet and thus instant communication. They are more aspirational and remain unresponsive to traditional marketing tactics. They focus on innovations, good reviews, rewards, and loyalty programs.

Generation Z, or iGen are the consumers born after 1995. Generation Z, the new consumers, have different attitudes and preferences as compared to their preceding generation of Millennials. They are described as hard-working, cautious and technology-savvy in behavior. "They are living in a generation of technology and online communication and are true digital natives" ^[39].

With such scenarios, it is vital to understand that people of all generations have a different personality; a fact that greatly helps in demographic targeting. For instance, Mercedes-Benz, as well as other German premium automobile brands are primary examples from the luxury segment providing a process in order to target a younger financially not yet solvent customer by making use of marketing segmentation. Their targeted customers are between twenty to forty years of age representing a potential customer segment of approximately 75 million people. This type of marketing fragmentation – basically including generation X and Y – represents a valid and very efficient method of displaying and also tapping into the buying potential of this customer segment.

The generation Z has since grown up and everyone surrounded by the omnipresence of technology has a different look on the automotive market, some of them heavily contradicting the general consensus on automotive. The acknowledged industry expert, Isabelle Helms, vice president of Cox Automotive, states that Generation Z comprises about 23 percent of the total population. Within 2020, this generation will have the purchasing power of almost \$3.2 trillion. At the same time, the marketing strategies elaborated for the Millennials will not be applicable for the following generation of car buyers. As a result, automakers and dealerships are heavily required to focus on the practicality bias of this next generation of automotive customers.

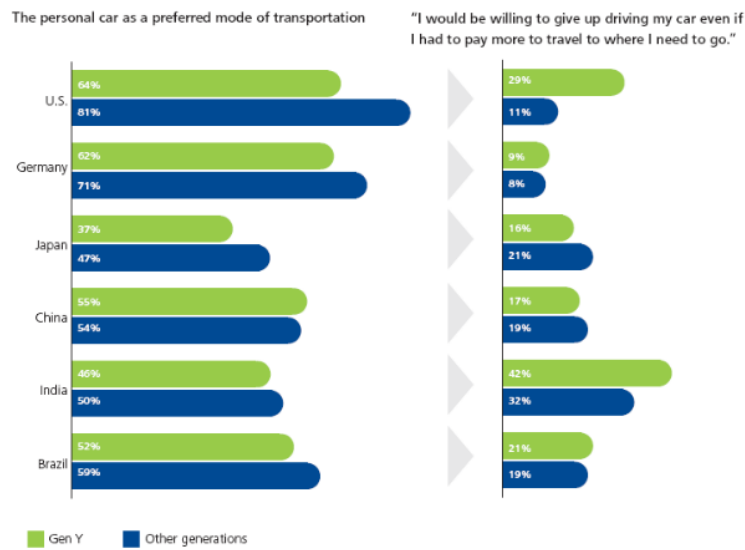


Figure 17: The personal car as a preferred mode of transportation. [40]

With the advancements in the digital world and technology, there have been a number of pre-purchase channels created through online media to engage with customers and address customers' needs. Today, consumers do complete online research prior to buying, influencing their purchase decision considerably. Hence, visiting showrooms has become a culminating event in the vehicle purchase journey. The showroom time is now spent asking questions limited to knowing the delivery mode and commercial transactions, rather than feature or functionality discourses.

8.3 Gen Z purchasing priorities

There has been drastic change in the purchasing behavior of the customers owing to the Gen Z attitude. Customers are now well-informed about the potential and services of a company from their diligent online surfing and research. Gen Z is smart and conscious in their purchase decisions. They do not rely on, nor provide extensive brand loyalty. This generation is humble and thinks very carefully while endorsing a brand. They value the brands only in connections with image in terms of the products image to fit the brand's ideals and morality.

They lay their complete focus on the 'product' and analyze the value of the product irrespective of marketing campaigns. They demand speed and are highly time conscious in their expectation towards services delivered to them.

Brand loyalty is not given easily. On the contrary, they expect, and prefer, brands which are loyal to them. Gen Z is extremely impatient; they require a seamless experience to remain with the company. They value time and potential and thus companies must work hard to win their loyalty. However, providing what they want at the right time, and in the way that they want it, seems to work.

The major attractions of Gen Z lie in innovation and sustainability. However, they are reluctant to invest money on something beyond the potential of the products. They are cost-conscious buyers and able to assess appropriate brands and services.

A study by Camplone at McKinsey provides statistics that 71 Percent of the consumers agree to choose tools for comparison of different brands, while 67percent go for online car configurations. "56 percent interact with the dealers by opting online chats. For able to receive much better and reliable information, companies need to opt for mass customization trends in their models to benefit the customers in the features they are interested"^[41].

Gen Z consumers are curators in nature and show off by expressing themselves through the products they buy. The internet boom has made them available the latest gadgets possible. Their product choices prioritize affordable, environment-friendly and technological updated products to ease their commute without compromising on safety. These digital natives want automation and the latest technical car features but still prioritize safe commute as an attribute of their responsible behavior. 61% of Gen Z think roads would be safer if most vehicles were fully self-driving, citing fewer distracted drivers and fewer accidents. However, the top barriers to adoption of fully self-driving vehicles are due to a lack of trust in current technology, and concerns over affordability.

8.4 Influence of Technology

Besides an ever-growing population, that is technology and new media savvy, Gen Z is seriously engaged in communication through social media. Therefore, they are more educated and aware of the choices they are open to.

Gen Z has higher expectations than ever and they need to be reassured of their deal. They not only buy the product, but also share post-purchase experiences through micro-blogs, Facebook, YouTube review videos and a growing number of other channels. Moreover, many of these young customers won't even mind purchasing the vehicle online, if it were an option.

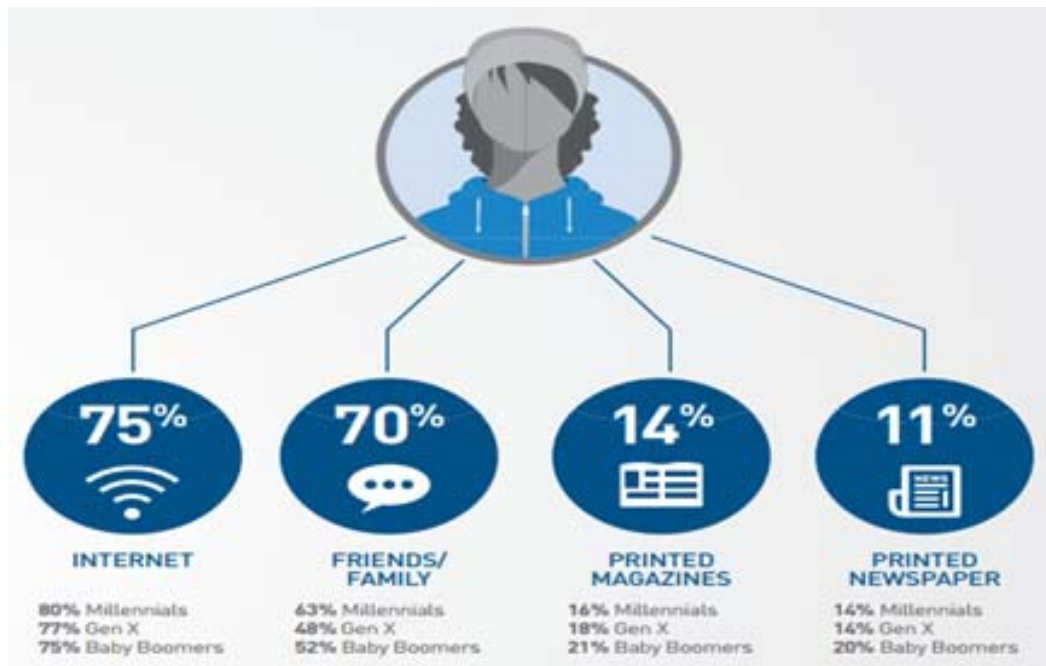


Figure 18: Sources used to find information on cars. [37]

Generation Z are fully immersed in the digital domain as they have grown up surrounded by it. Also known as digital natives, they are communicating and gathering information via social media, living a so called connected life. This connectedness is not limited to an interpersonal level, but extends to their interaction with products and brands and even further.

Because of this immersion in technology, social sites are not important to Gen Z from use perspective only, but also affect their choice as it influences their behavior. There are several influencer circles on the social platforms that act as real disruptors in Gen Z shopping preferences. Gen Z is largely interested in videos and pictures. YouTube becomes one of the most influencing channels followed by Facebook, Instagram and SnapChat. YouTube in particular has a unique spell on Gen Z users, while Facebook affects both Gen Z and Millennials.

Gen Z manages its personal and public identity over social media. Thus, companies are required to understand the behavior of their customers in order to effectively engage with them. For instance, using messengers and other instant Chat applications (e.g., WhatsApp) by the companies, increase the Gen Zers' dependence and trustworthiness. The major way of collecting information and social communication with the newer generation has been through technology only. A study shows over 75% of Gen Z buyers use online media and internet for gathering information about vehicles including cars.

8.5 Shift of customer demands from product centric to service centric

An automobile purchase is not as simple as smartphone buying. Automobiles are greater investments and their marketing channels and customers' reach is also different. The out-the-door prices of vehicles are variable from place, dealerships and payment modes. Therefore, customers are very cautious with their needs and interests, as a result of which customers are highly influenced by the services provided by the companies during their purchase journey.

In the 20th century, automotive OEMs had to reach out to their customers via available channels like wholesale retailers, travelling salesman or showrooms. Therefore, the major emphasis of the companies at that time was to prioritize the product that they provide and expanding its sales to the maximum number of buyers possible. However, although these channels are still relevant today's customer behavior is on a drastically different path. In particular, the younger generations of car buyers (Gen Y, and now starting Gen Z) are embracing digital technologies strongly, having caused a rise in a number of opportunities for customers to evaluate products. Thus, the main focus of companies has been shifting, from emphasizing on the manufacturing sectors, to enhance the product and features and services that they offer.

Consequently, there has been need for continuous innovation particularly in the automotive sector. OEMs have been under pressure to adapt in accordance with their competition. Their focus has observed a shift from a purely product-based approach to customer-centric needs. Digitally sold services, remote vehicle health

diagnostics, and driver health services, significantly impact the business processes and its models [42].

An important consideration to gain success among competitors is to understand the drastic shift in the priorities of the customers. The change has been linked with the modifications in customers' needs and preferences. Worldwide sales reached record 88 million autos in 2016, up 4.8 percent from a year earlier, and profit margins for suppliers and auto makers (OEMs) are at a 10-year high. "Nonetheless, viewed through the lens of two critical performance indicators, the industry is in serious trouble" [43]. The automotive industry has to deal with:

- large overcapacity
- unsatisfactory customer confidence
- reduced margins

The major concerns of today's customers include brand responsibility from OEMs and service experience. Therefore, the automotive industries must increasingly prioritize their relationships to a customer and service-centric approach, rather than being solely manufacturing centric. Owing to top concerns of customers that include delivery, complaints, and visible uptime of the vehicle, the customers expect cost effectiveness, time reduction in workshops, and low maintenance and service costs. Because of this competitive shift, the changing trends of the services have caused a rise in customization of vehicles, attributing to innovation and sustainability.

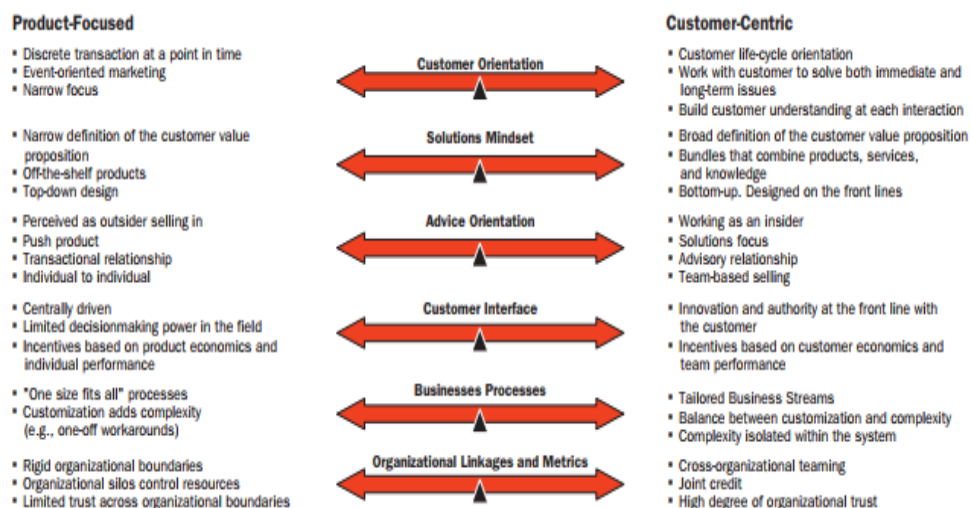


Figure 19: From Product-Focused to Customer-Centric. [44]

With the emergence of digital interactions through mobile technologies and social media, there have been redefined communication patterns that influence the customers' behavior and priorities. Digitization thus has revolutionized the retail formats by increasing the expectations of the customers, resulting in a substantial change. Consequently, consumers from Gen Z expect omni-channels to address their online shopping journey with the dealers to have ready and updated access to information during their purchase journey. An understanding of deep technical details of the car and its features has become a key requirement in the purchase process. The customers know the significance of newer technologies entering the market. Connected and electrified vehicles with advanced infotainment and safety technologies are the new major interest of a vastly growing number of customers. They expect their dealers to know about the latest technical features with maximum connectivity and newest applications. In this regard, some OEMs have already started to make their way to customer satisfaction by upgrading the existing products with the latest technology; 3D configurations, video-screens, inbuilt GPS, online updates, upgrades and so on. Additionally, innovative software developments allowing for connected and autonomous features are other advancements which customers look for and industries are researching in.

However - and this is a major change in purchasing behavior which must be highly considered by automotive OEMs - Gen Z no longer relies on or reflects on famous brand experiences. Instead, they believe in practical products. 60% of Gen Z values a cool product over a cool experience, in contrast to 40% of millennials. They do not appreciate the ads creating emotional attachments for the products. There has been a decrease in love for such ads from 31% to 20% in Gen Z.

"This evidently indicates that Gen Z has less perceived value for brand and brand-products. They are very introspective with their priorities and choices" ^[45].

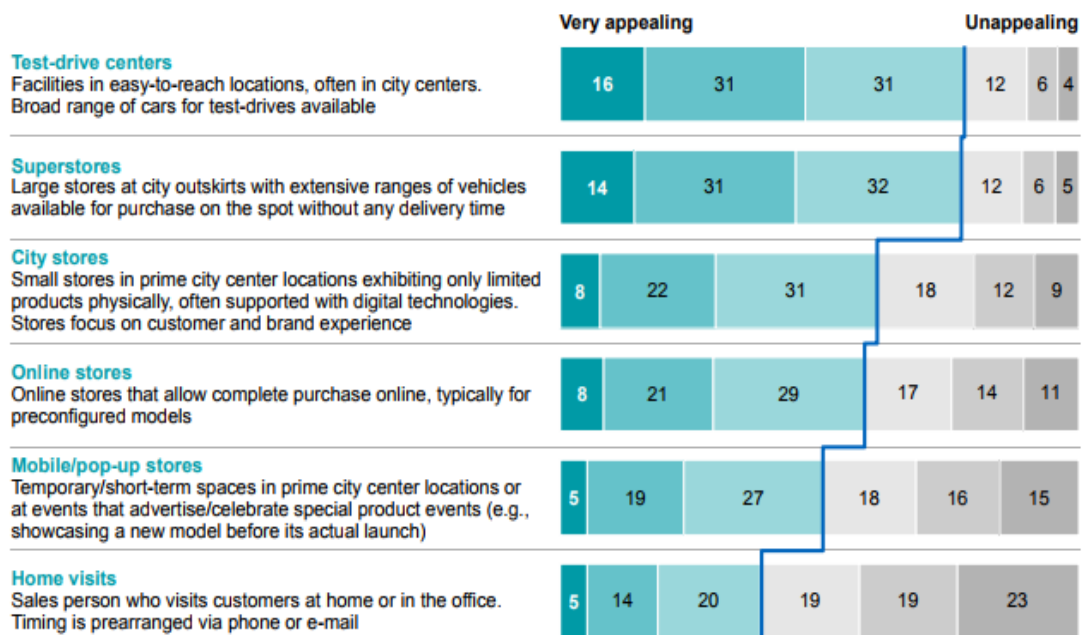


Figure 20: Appeal of new store formats to customers. ^[46]

Thus, the orientation of the industry has become customer-centric, assuring the increase in customer satisfaction with quantified customer segmentation strategies. Customer segmentation refers to segmenting a heterogeneous market with prospective customers of different choices and needs into sub-groups of perceived commonalities to effectively direct promotional attention. In automobile industry, there are three major groups on the basic psychographic segmentation:

- People buying cars for economy
- People buying best product for their money and
- People buying for self-enhancement and social status

In recent years, segment 2 has grown significantly valuing the product over anything. Therefore, companies need to develop strategies to satisfy the needs and expectations of this segment.

With the emergence of new businesses, the alignment of existing business models must be done accordingly. Those companies, who succeed in effectively managing the emerging digital technologies, are able to improve the buying experience and engagement with their customers. This accounts for creating new lines of business and business models to streamline their operations ^[47].

The Service Economy – across all business segments – accounts for 20% ~ 30% of revenue of a given industry. However, the profit achieved from this sector is at 45% ~ 50% compared to the profit derived from the sale of new goods which is at approximately 55% ~ 50% of total revenue. Therefore, any rise in service revenue and reduction in service cost can increase the service profits by a significant amount. These – roughly estimated – figures alone not yet considering the other competitive benefits offer an argument for justifying the required investment in the (connected) service part of business.

Thus, the future prospects of business in the automotive industries aims to improve inventory visibility and maximizing profitability per customer. The idea is the management of customer lifecycle rather than product lifecycle. Ultimately, the automotive industry realizes that differentiated services based upon customer segmentation and categorization provides good opportunities for improving customer loyalty and retention, hence to stay and prevail in business with new generations.

Chapter 9: Framework of how to assess the Automotive Industry and compare it with other industries (Ytsma)

9.1 Introduction

According to the research model, explained in Chapter 4, it is required to quantitatively assess the industry structure of the automotive industry to be able to evaluate whether the European automotive industry is:

- capable of reinventing or evolving existing business models,
- adopt to the needs and changing demands of today's customer,
- adopt to a changing business landscape,
- evaluate the various threats imposed to the industry

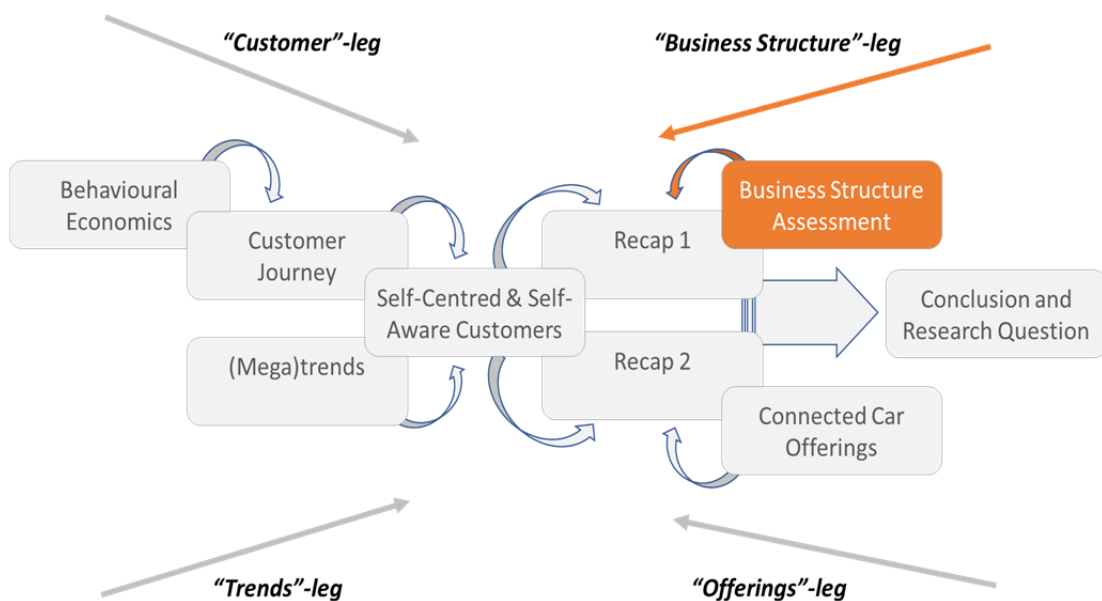


Figure 21: Influence Model – Business Structure-leg

The answers to these questions will allow us to understand whether the industry is able to sustain as a profitable business. The mature, 130-year-old industry has been affected by a multitude of factors since its conception. Mercedes-Benz launched the first automobile that changed the way humans live, work and travel. But it was also the start of what Peter Drucker refers as the "industry of industries".^[48] “

The reason Drucker made this statement is clear if we consider the industry's scale, the share in total manufacturing employment, GDP and exports as well as its numerous forward and backward linkages with the rest of the economy" [49] In this mature industry, producing a mature product according to Vernon's product life-cycle model, the pressure to reduce production cost, improve quality, and optimize logistics resulted in revolutionary, ideas like Toyota's Production System.^[50] The product itself evolved from a mere substitute for a horse and carriage to a technology advanced product. "The typical car contains about 2,000 functional components, 30,000 parts, and 10 million lines of software code."^[51]

9.2 Porter's Five Forces

Various tools are available to assess industries. Two known set of tools are PESTLE and Porter's Five Forces. The focus of this Thesis is the influence of the end-customer and to a lesser degree forces covered in PESTLE like; Political-, Economic-, Legal- and Environmental-force. This consideration lead to the preference of Porter's Five Forces over PESTLE to examine in detail the power of the buyer, the competition within the automotive industry and the effect of both on the profitability of the industry.

In the year 1979, the paper "How Competitive Forces Shape Strategy" was published by the, at that time, associate professor Michael E. Porter in the Harvard Business Review. The main objective of Porter was to provide a set of tools that allow businesses, and especially strategists, to understand competition and make the right decisions to ensure mid- and long-term profitability. In Porter's view, an assessment of a business' competition solitary is not providing enough information to prevail as a business. It is perceived as "too narrow" considering the multidimensionality of almost any business, and the especially in today's rapidly changing business climate. Porter's Five Forces include the following, competitive forces:

- Competition
- Suppliers
- Potential Entrants
- Substitute products
- Customers

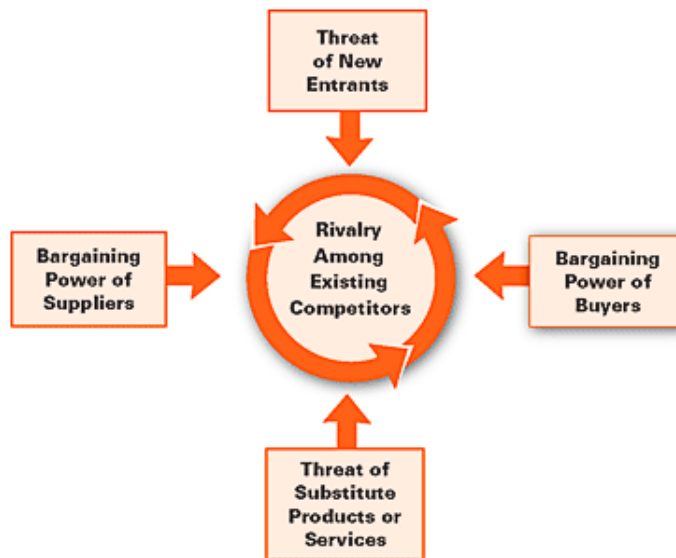


Figure 22: The Five Forces of Porter. ^[52]

Besides a thorough analysis of the competition within a specific industry itself, the Five Forces, hereafter commonly referred to as P5F, allow for comparing of different industries, its underlying structures that define **competition** and **profitability**. ^[52] The two elements that are deemed to be critical answering the business side of the research question.

9.3 The Five Forces model

Within this paragraph the functioning of the Five Forces will not be explained in detail and considered state-of-art. However, the relevance of each of the Five Forces will be explained, including the limitations of Porter's model.

In general, the Five Forces have a direct impact on the industry structure and the profitability in the mid- and long-term. Innumerable factors influence the day-to-day profitability of day-to-day business, but only a few affects the long term. In case the Five Forces are intense, the structure of the business is challenging to provide a profitable business environment.

For example, new entrants offering a substitute product or service. Note that in this example there is a threat from two forces at the same time;

- Potential Entrants
- Substitute products

This will drive the incumbent companies of this specific industry to increase investments to differentiate its product portfolio, drive (production) cost down through efficiency or renegotiate better conditions with suppliers. In contrast industries that are characterized by moderate or low intensity of the Forces allow companies to be more profitable or have a relatively high “return-on-investment”-rate.

The limitations of P5F are among others the potential over simplification of a business, ignoring some of the PESTLE factors, which was decided based on solid grounds, as well as the dynamics of a market. The last one can't be overlooked considering the new, fluid boundaries of any business and as such, we will factor the dynamics of the market into our assessment. This is largely based on our findings regarding the trends described in Chapter 7 – Megatrends in the automotive industry.

A good example of a new entrant, emerging from a start-up that started threatening and controlling existing industries is Amazon. This e-commerce company started offering solely books and rapidly expanded its products and services to become the world's largest e-commerce platform. It is now offering cloud services branded Amazon Web Services (AWS), entering the markets traditionally dictated by IBM (Bluemix) and Microsoft (Azure) and Internet of Things (IoT) products like the Amazon Alexa and Echo. ^[53]

To cater for these fluid industry boundaries and the rigidness -and potential limitations of Porter's framework-, the interdependencies between the Five Forces will also be considered when using P5F. ^[54] The interdependencies are:

- Backward integration
- Forward integration
- New entrants encouraged
- Search for substitutes

The following figures shows the position of the interdependencies within the existing, standard model of Porter's 5 Forces.

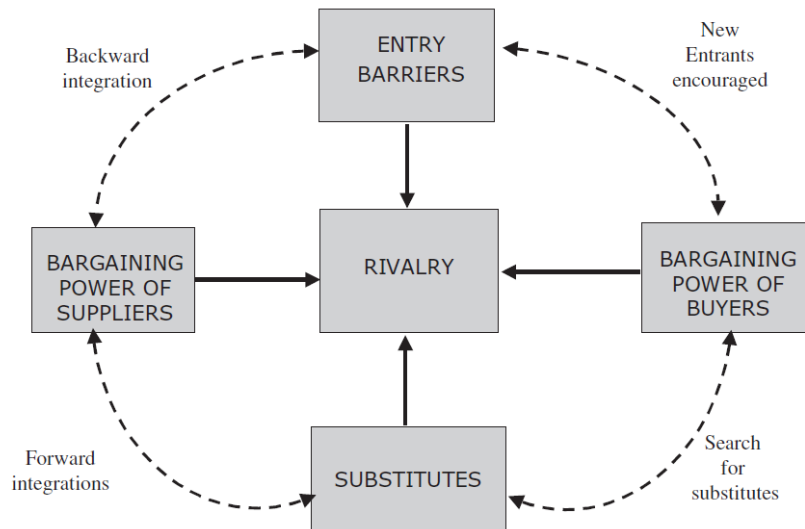


Figure 23: Porter's five competitive forces: key internal interdependencies. ^[55]

Since the research question focuses on the demand-side of the industry, the bargaining power of the supplier, as well as the interdependencies forward and backward integration, are considered as less relevant. The focus will be on the bargaining power of the buyer and the interdependencies:

- New entrants encouraged
- Search for substitute

9.4 Conclusion

To answer the research question and validate the hypothesis, it is essential to assess the structure and profitability of the automotive industry in the mid- and long-term from the OEM's point of view. The focus will be on the demand-side of the framework, although all 5 Forces will be validated when it comes to their individual intensity as well as the two interdependencies that link:

- The bargaining power of the customer with the Substitutes, and
- The bargaining power of the customer with the Entry barriers

Chapter 10: Selection of OEMs and the industry to compare the automotive industry with (Ytsma)

10.1 Introduction

In order to answer the research question, there is a need to limit the number of OEMs that will be investigated using P5F, the region in which the OEMs act as well as the industries, that will be compared with the automotive industry from a profitability and structure point of view.

10.2 The Region

The selected region for validating the hypothesis is the European region. The reasons for selecting this geographical area are due to its size and the variety of brands and models which are sold in European market. Furthermore, Enlarged Europe (EU + EFTA) is known for its variety of customers and regional differences with regards to regulations and preferences. An example of regional differences is the sale of electrical and hybrid vehicles in Norway compared to the French and Italian market, where diesel powertrains are far more popular. In the Norwegian market, the tipping point was reached recently, selling more vehicles with alternative propulsion technologies than anywhere in the world. ^[56] The swing in regards to preferred power trains is just one example of the interesting dynamics in the European market.

In total, the EU accounted for 15.116.344 vehicle registrations in 2016. The following graph shows the number of new passenger's cars registrations from 2001 onwards. The following will need to be noted. Prior to 2006 only the registration of the EU15 + EFTA is considered. Only after joining the EU in 2004, were the vehicle registration of these new member states tracked.

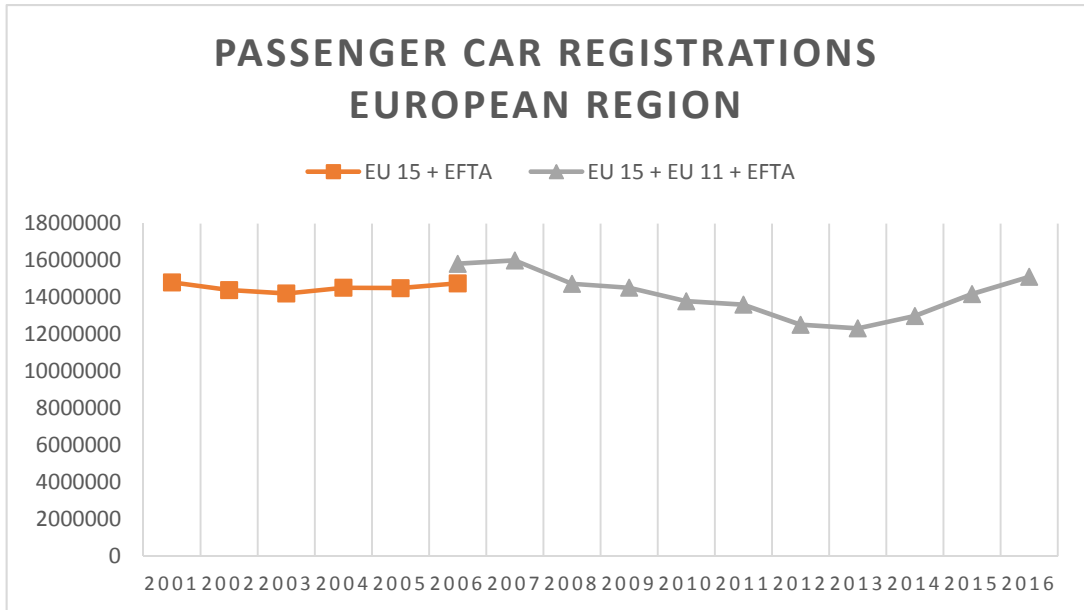


Figure 24: Passenger Car Registration EU. ^[57]

This region accounted for 19% of the global passenger registrations with a total of 13,7 million units in 2015. In the same period, 73,2 million vehicles were sold globally.



Figure 25: World-wide vehicle registration split. ^[58]

The sales figures for 2015 split per brand are presented in the table below.

| BRAND | VOLUME | BRAND | VOLUME | BRAND | VOLUME |
|------------|-----------|------------|---------|--------------|--------|
| VOLKSWAGEN | 1.723.175 | CITROEN | 552715 | SMART | 96.196 |
| FORD | 1.031.092 | HYUNDAI | 467.837 | JEEP | 87.488 |
| RENAULT | 974.055 | KIA | 385969 | DS | 71.425 |
| OPEL | 939.918 | DACIA | 375.801 | PORSCHE | 68.033 |
| PEUGEOT | 854.600 | SEAT | 337.700 | LANCIA | 61.541 |
| AUDI | 766.022 | VOLVO | 285.454 | ALFA ROMEO | 56.719 |
| B.M.W. | 747493 | MAZDA | 211.223 | SUBARU | 39.635 |
| MERCEDES | 742961 | MINI | 187.578 | JAGUAR | 39.449 |
| FIAT | 655.925 | SUZUKI | 180.516 | CHEVROLET | 2.437 |
| SKODA | 617.910 | LAND ROVER | 138.982 | ASTON MARTIN | 1.594 |
| TOYOTA | 560.899 | MITSUBISHI | 132.674 | IVECO | 622 |

Table 1: Sales volumes per brand in the European Region per brand in 2015. ^[59]

10.3 The OEMs

The ability to innovate is key in developing new products and features, business models and responding timely to the changing wishes and needs of customers. When selecting the 3 German OEMs (Audi, BMW, Mercedes), the focus will be on the level of innovation of the respective OEMs. The first challenge is to identify what innovation is and how to value and compare this with peers. According to the Balanced Scorecard Institute, the objectives of innovation are to:

- increase the number of new ideas,
- improve the quality of ideas,
- implement ideas more efficiently,
- improved (financial) results from the implementation of new ideas. ^[60]

In an industry where investing in Research & Development (R&D) is topping at an average of 15,4% of its total revenue. ^[61], It is hard to define whether this is mere development, research, or innovation according to the objectives as discussed previously. However, the past has proven that innovation comes from European (premium) OEMs like BMW, Mercedes and Audi. Good examples are the Anti-Lock Brake System (ABS), introduced by Mercedes-Benz in 1978 and matured for production in December of that year. ^[62]

More recently, Audi introduced the first 4G enabled vehicle in the US in 2014.^[63] GM followed shortly with On-Star and now more and more brands offer Wi-Fi hotspots in vehicles using a 4G data connection. Another example is the introduction of BMW's CarData platform in May of 2017.^[64] This platform enables end-customers to control the access rights of third parties to their personal data as well as the data collected by the vehicles they have used or own. More details on BMW's CarData platform will follow in Chapter 12.

Combining both the quantitative, financial effect of innovation in total shareholder return and a softer, subjective ranking by senior executives of various industries leads to an overall ranking of the world's most innovative companies. This survey is executed by the Boston Consultancy Group on a yearly base and the results of the 2016 survey are indicating the following top automotive companies.^{[65][66]}

| OEM | AUTOMOTIVE RANKING (2016) | OVERALL RANKING | | |
|---------|---------------------------|-----------------|------|------|
| | | 2016 | 2015 | 2014 |
| TESLA | 1 | 3 | 3 | 7 |
| TOYOTA | 2 | 8 | 6 | 8 |
| BMW | 3 | 14 | 7 | 18 |
| DAIMLER | 4 | 16 | 10 | 25 |
| GM | 5 | 27 | N/A | 26 |
| RENAULT | 6 | 38 | 33 | N/A |
| HONDA | 7 | 48 | N/A | N/A |
| AUDI | N/A | N/A | N/A | 28 |

Table 2: Innovation raking by the Boston Consultancy Group 2016 - Automotive.^[67]

Based on the innovation ranking from the Boston Consultancy Group, the traditional "leader" behavior of the German OEMs and a strong presence in the European region, the following OEMs will be assessed in detail:

- BMW
- Daimler
- Audi

The main reason for not selecting Tesla is the fact that, although the company is both innovative when it comes to propulsion technology and connected services, the company is a new, disruptive entrant and certainly not an industry veteran. In addition, Tesla is currently active in a niche market. However, this may change in the next year with the introduction of the Tesla Model 3.^[68]

Toyota, on the other hand, is one of the industry's all time largest players when it comes to global presence and sales numbers. The company leads the way when it comes to new propulsion technologies such as hydrogen, hybrids and plug-in hybrid vehicles. Though, new propulsion technologies are likely to change the mobility demand of customers and the way we will be using vehicles in general, this is not the area where Toyota outperforms the German premium OEMs. For this reason, Toyota is not considered.

10.4 Non-Automotive Industries

To be able to understand to what extent the structure of automotive industry is changing, which will inevitably lead to changed profitability levels according to Porter's framework, and whether the selected German premium OEMs are able to react aptly, it is important to compare the automotive industry with industries that faced a similar disruptive change. An overview of disruptive changes, currently faced by the automotive industry, is described in Chapter 7 – Megatrends in the automotive industry.

An industry, which went through a similar change is the mobile phone or smartphone industry. The mobile phone industry reached maturity rapidly, growing to billions of units annually and the purpose of the device itself changes significantly with the introduction of the smartphone compared to the feature phones that were sold in vast numbers before the introduction of the smartphone. These two factors altered the structure of the business so swiftly that new entrants had the possibility to become the most dominant players whereas other companies did not survive. One of the most significant companies that were heavily impacted was Nokia. The mobile phone industry will be assessed by making use of P5F, with a special focus on Nokia.

Chapter 11: Assessment of the automotive industry (Ytsma)

The first industry to be assessed, applying Porter's Five Forces, will be the automotive industry. As mentioned previously, the focus of the assessment will be centered around the following elements, relevant to answer the research question of this Thesis:

- Demand-side
 - Bargaining Power of the Buyers
 - Threat of Substitute
 - Threat of New Entrants
- Sub-forces on Demand-side:
 - New entrants encouraged
 - Search for substitute

However, all 5 Forces will be assessed to understand the industry structure and compare the automotive industry with the mobile phone industry. It is important to mention that a snapshot of the industry will be taken. This means that future movements and directional business changes of the industries will not be considered. This means that the principle business of the automotive industry is to develop, produce and market automobiles. Other businesses of the OEMs are at this present moment marginal, in terms of profit contribution and revenue, compared to the core business of any OEM.

11.1 Threat of Entry

It is important to note that it is not the actual entry of new entrants that put a limitation on the profitability of the industry, but the threat alone has already a potential major impact on the future profitability of the incumbents. It will force them to keep investing and at the same time keep the prices at a lower level, in case the force is strong. New, potential entrants might come from other markets, which will fund their entry into the target market. In case the synergies are obvious and the core business of the new entrant is profitable, the force will become larger and increasingly threatening. For the assessment of the industry, the process indicated in the paper released by Michael E. Porter on January 2008. ^[52] will be applied.

11.1.1 Supply-side economies of scale

The automotive industry is a strong, vertically integrated business. The lower tiers tend to possess more competencies, since they are more involved in non-production related activities like research and development of products and services. Whereas the higher tiers have a strong tendency to generate a greater value per employee according to Pavlinek and Zenka (2016).^[69] The relationship between the OEMs and their suppliers is based on the following:

- 77~80% of the value is created by the suppliers
- Increased competency levels at suppliers
- R&D acceleration of new Power Train concept, ADAS functionalities and V2V
- The final assembly of the vehicle is always controlled by the OEM
- The marketing, sales and logo is owned by the OEM

The results of the above-mentioned facts are that the OEM relies more and more on the technical competency of the suppliers, whereas the supplier relies on the market penetration of the OEM and its capabilities to market and increase the number of vehicles globally, year on year. For new entrants, as an OEM, it is considered nearly impossible to sign contractual agreements with suppliers that will provide the new entrant both access to the latest technology and/or at a cost level that allows the new entrants to compete with the incumbents.

This sub-force is considered: weak

11.1.2 Demand-side benefits of scale

This sub-force is only limited when applicable to the automotive industry. The willingness of the buyer to purchase a vehicle is not based upon the number of people that have already bought a vehicle. On the other hand, this so-called network-effect is, to a second degree, applicable to the automotive industry. The reasoning is the following; in the event that more people are purchasing a brand, more outlets will be required to sell and service the vehicle. The proximity to a brand outlet is effecting the decision of visiting the retailer.^[70] According to studies executed by Accenture, buyers in Germany prefer to buy and pick-up a new vehicle at the local dealership. The respective percentages are 46% and 61%.^[71] This varies globally, but the survey indicates that the willingness to buy a vehicle online never

exceeds the 19%. The conclusion is that retail and flagship outlets are still playing a key role in the decision-making process of potential buyers. The incumbents have a strong retail network and this will protect them against new entrants for the moment.

This sub-force is considered: weak

11.1.3 Customer switching cost

These are generally referred to as costs that are incurred when switching from one brand to another. Within the automotive industry, changing from one brand to another is possible without too many extra costs. Although, the residual value of the vehicle might be marginally less if the vehicle is traded in by a retailer from a different brand. In contrast to that, there are also strong financial incentives from OEMs and National Sales Companies (NSCs) to convince buyers to change brands. For this reason, the view is that there is no genuine lock-in state from an end-customer's point of view.

This sub-force is considered: moderate/strong

11.1.4 Capital requirements

The capital requirements for entering the automotive industry are not limited to the production of the product itself, but also extend to up-front expenditures in the following areas; marketing, research and development and financing. Another angle is the expected Return on Capital. In case the capital requirements are considerable of size, but the expected, long-term Return on Capital is matching, it will be easier to (up-front) fund the investments required to enter the automotive industry.

The automotive industry is considered as one of the industries with the largest investment in research and development. This is illustrated by Volkswagen topping the chart of R&D spend for the last 5 years. Other OEMs that complete the top-20 are Toyota, GM, Ford and Daimler.^[72] Cost of sales, accounting for expenditures in marketing and financing, among others, drive down the EBIT margin to an industry average of 6,35%.^{[73][74]} This is visualized in figure 26: *Average EBIT margin automotive*.

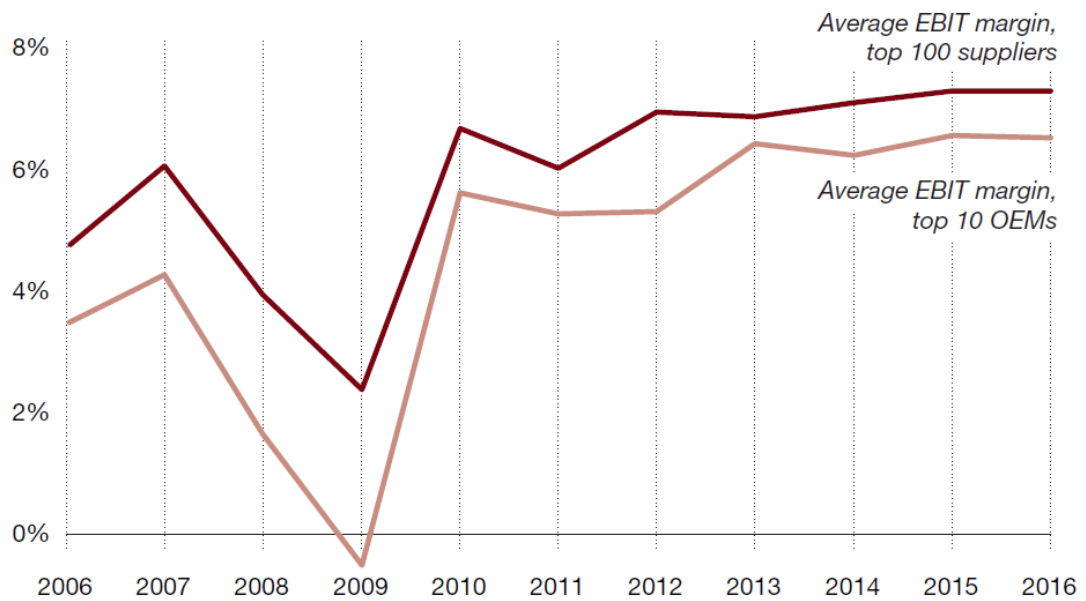


Figure 26: Average EBIT margin automotive. ^[75]

Although the graph shows the highest EBIT margin in the last 10 years, it is important to look closer at the cost of capital or Weighted Average Cost of Capital (WACC). Although, the cost for capital is at an all-time low for years, the automotive industry's cost of capital is averaging at 4,16%.^[76]

Considering the above discussed ratios, entering the automotive industry requires a significant investment in research and development to produce vehicles that meet the current (and future) standards for safety, environment and user experience. The high cost of goods sold is negatively impacting the EBIT and the cost of capital is significant. The conclusion is that the automotive industry is rather unattractive and financially less lucrative to enter compared to other industries.

This sub-force is considered: weak

11.1.5 Incumbency advantages independent of size

As part of this assessment, it is key to understand whether new entrants will face specific challenges that can't be overcome solely with size or capital. This is identified as cost or quality advantages of the incumbents. Since the automotive industry is an old industry and vertically integrated, entering the market while immediately competing on quality and cost will be virtually impossible. Recent history shows that Tesla, as a prime example, is facing challenges when it comes to the

essence of the industry; producing high quality vehicles in a mass manufacturing fashion. ^[77] The steep ramp-up in production volume, meeting customer demand and overall vehicle quality will be a demanding exercise for Tesla. As a result, it can be assumed that incumbents have a significant advantage over entrants when it comes to entering the automotive market. However, it isn't impossible if Tesla motors is considered as an example, although this company seems to be a rare example of succeeding entering the mass-manufacturing automotive industry.

This sub-force is considered: weak

11.1.6 Unequal access to distribution channels

This sub-force has partially been discussed as while assessing the “*Demand-side benefits of scale*”. Based on the information provided, it is both costly, time consuming and a necessity having a solid distribution network to sell vehicles. It isn't only the sales activities, but also the warranty and repair activities that require a strong sales network. For new entrants, the internet could become an alternative. Although in the Western world, currently no more than 10% of people are considering buying a vehicle, end-to-end, on the internet. ^[71]

It will be possible to partner with third parties providing warranty and repair services. With software over-the-air (OTA) updates, access to car updating firmware and software will become easier and cost effective, but the increased technology levels of automobiles will also require dedicated engineers to work on the vehicles. ^[78] The conclusion will remain; having a dedicated sales and service network to compete as an entrant with established OEMs, is an essential investment. The costs to establish this network are substantial.

This sub-force is considered: weak

11.1.7 Restrictive government policy

Within this sub-force, it will be assessed whether governmental bodies are hindering or supporting possible entrants to access a market. Governments have a multitude of tools to directly and indirectly control access of new entrants. From a global economic perspective, the automotive industry is present in virtually every country in the world. Whether this is through the supply of raw material or the actual production of a vehicle.

The value contribution of the automotive industry, measured through GDP, varies per country. Germany, as an example, is supporting the automotive industry because of its significant role in the overall R&D spend (33%), being a large employer (>750.000 direct jobs) and supports the export surplus of Germany. This export surplus is directly supporting Germany's strong position in the world economy. Automotive industry accounts for more than one third of all industrial R&D spending in Germany and for 30 percent of R&D employees.^{[79][80]} Another clear example of government's (in)direct influence are the regulations surrounding the automotive industry. Making vehicles safer and less pollutant, countries and economic regions like the EU have developed a large set of regulations to comply with. It is assumed that the importance of the automotive industry for the local economy, at a country-wide or regional scale, influences the behavior of governments supporting the local industry by means of stringent regulations. The threat of new entrants entering the market will be reduced by the above-mentioned set of measures.

This sub-force is considered: weak

11.1.8 Expected retaliation

Predicting whether the incumbents will react forcefully when a new entrant enters the market is challenging. From the past, it is rather clear that retaliation is relatively weak. Again, Tesla is a good example. However, fact-based evidence is not present if normal business competition actions, like price-cuts, as specific marketing communications are not considered as retaliation.

This sub-force is considered: weak

11.2 The Power of Suppliers

This important force of P5Fs is based upon the following characteristics used to describe the suppliers and their industry as part of the Automotive industry:

- Concentration of the industry
- Dependability of the industry
- Switching cost
- Differentiating offerings
- Substitutions
- Forward Integration

Generally, the force of the supplier is more powerful in the following cases, based on the characteristics mentioned above:

1. In case the supplier industry or group is more concentrated than the industry it provides services and products to. The number of (Tier-1) suppliers versus the number of OEMs is a good measurement. According to the figures of 2015, 14 OEMs own in total 55 brands. In that same year, more than 100 suppliers provide their products to these 14 OEMs. The top 10 of the 100 suppliers account for 38% of the total revenue generated by selling original equipment parts to the OEMs. (Total Revenue 2015 = \$751.405, Top 10 Revenue 2015 = \$287.402).^{[81][82]} Thus it is clear that the supplier industry is certainly not more concentrated than the industry it sells to.

2. In case the supplier or the supplier group is more dependent on the automotive industry it sells to, the suppliers are willing to offer products and services for a reasonable price. As a result, the profitability of the OEMs isn't necessarily capped by the pricing of the Tier-1s. However, considering the top 5 of Tier-1 suppliers in 2015, it is apparent that these companies (or business units) are depending on the automotive industry:
 - Robert Bosch
 - Denso Corp.
 - Magna International
 - Continental
 - ZF Friedrichshafen (with the recent acquisition of TRW, the company ZF-TRW has moved up to the 2nd place)

It is worthwhile noting that the mobility division of Robert Bosch accounts for 60% of the (companies) total revenue generated in 2016.^[83]

3. The cost of switching from one supplier to another supplier is unlikely to play a role for the OEM. The main reason is that the OEMs have implemented dual-sourcing strategies on the one hand and are focusing on strategic partnerships on the other. In the first case, the OEM can switch from one supplier to the other without considerable cost implications.

4. In the latter one, (jointly) developed technologies will require a commitment in terms of NRE cost amortization or a particular number of units that will be purchased over a period of time. In this case it is more likely that the OEM will not change supplier so easily, but high switching costs are not to be expected.
5. In case a supplier is offering a differentiated product, that can't be offered by another supplier, the supplier will have more power and is likely to drive the price to the OEMs up. Considering the product ranges offered by the top 10 Tier-1s it is conceivable that the OEM can pick the supplier to work with and it is certainly not the supplier that has the ability to demand a high profitability.
6. Similar to differentiation, the supplier's power will also increase in case the product or service can take the place of another supplier or product. Based on the earlier assessment of both a larg(er) number of suppliers compared to the number of OEMs as well as the fact that products with a particular function can be purchased by different suppliers, the supplier's power based on limited substitution options is rather limited.
7. In the explanation of Porter's 5 Forces, the risk of forward integration is defined as; the likeliness or threat of suppliers entering the market of their customers (the OEMs). The prime reason to be considered is that the suppliers expect to increase value or earn more. Assessing this 6th supplier sub-force is also strongly related to the first force "Threat of Entry". Since much of the value creation is already with the suppliers and the suppliers don't own the brand (marketing) as well as the dedicated retail network, it is very unlikely that they will enter the market of the OEMs. Magna International is producing vehicles, but that is as far as the forward integration will evolve.

Considering the assessment of the supplier strengths, the findings are that the commercial relation between the supplier (Tier-1) and the OEM is well-balanced, although slightly more favorable for the OEMs if specific conditions are taken into consideration.

However, the strongest threat is likely the consolidation of the suppliers that will concentrate their industry. ^[84] Although, it should be mentioned that the OEMs are also pushing for supplier consolidation to reduce, among others, the supply chain complexity. This push for consolidation is graphically illustrated in figure 27: *M&A deals – volume and value.*

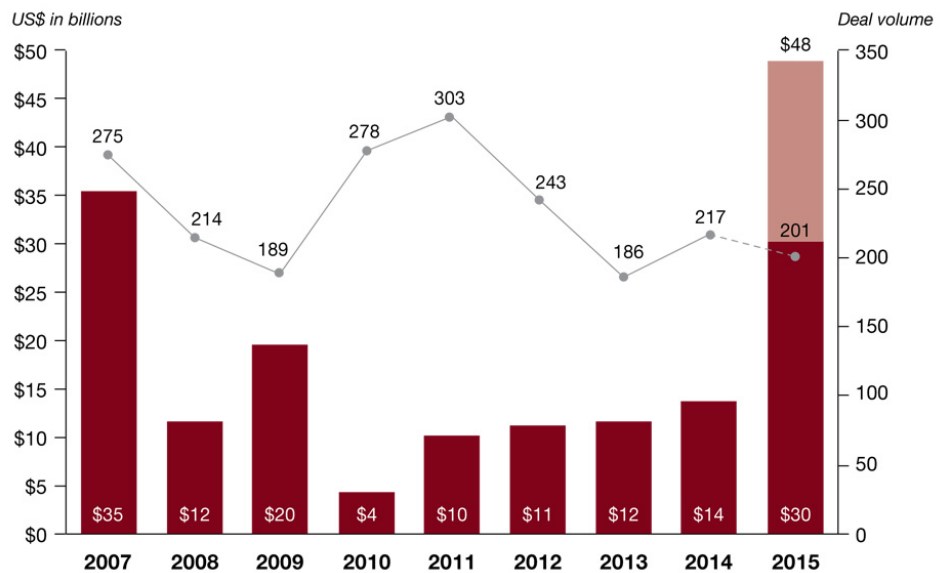


Figure 27: M&A deals – volume and value. ^[85]

11.3 The Power of Buyers

Opposite to the power of the supplier is the power of the buyer. In this case, the buyer is defined as the end-customer, although it is important to note that lease and rental customers (B2B) play a key role when it comes to purchasing vehicles from OEMs. However, when it comes to the final decision of using the mobility service, offered by means of a vehicle, the final end-customer (driver and/or owner) is a natural person. This natural person has specific preferences, and characteristics that are key to define based on the following sub-forces that define the overall strength of the power of the buyer:

- Volume of purchase
- Undifferentiated customer?
- Switching cost
- Price sensitivity
- Quality

The individual characteristics will be assessed to define the force of the buyer.

1. Considering the fact that in Europe, the average number of passenger cars per 1000 inhabitants is 500 and the average age of a vehicle in this region is 10.7 years, the conclusion is that the volume of purchasing is not providing the buyer the power to reduce prices significantly and as a result affect the profitability of the industry.^[86, 87]
2. To a certain degree the offerings of all OEMs are the same. The concept, the high-level appearance and the generic function is identical amongst all manufacturers and brands. The real differentiation is in image, brand value and brand perception. However, the prime decision-making factors, selecting a car, have changed and the top 5 are currently.^[88]
 - Price
 - Running Cost
 - Reliability
 - Vehicle Type
 - Safety rating/features

This indicates that the key element is driven by budget and the willingness to spend money on the prime reason for a vehicle purchase, which is mobility. Since multiple brands, if not all, offer the same base function, customers have plenty to choose from. This increases their force and has a direct, negative impact on the profitability of the industry. The change in customer behavior was previously further elaborated in chapter 6 and 7.

3. End-customers are in a comfortable position of switching from one brand to another without switching costs. This results in a relatively low retention rate when purchasing a new vehicle, compared to other industries and brands. The risk of losing customers and thus direct sales as well as the effort of attracting new customers (and make up for the customers that decide to switch brands) is driving the profitability of the industry down.
4. The buyer is very much aware of the cost of a vehicle. The purchase of a vehicle, whether this vehicle is paid in cash or financed, is one of the largest

financial commitments for a household. The awareness of this is significant, hence the top 5 of decision-making factors were listed under sub-section 2. The top 3 are primarily driven by the financial impact of purchasing and using a vehicle. Subjective, brand differentiating, factors are less relevant. The fact that car buyers are price sensitive, increases their force.

5. Quality has an impact on the customer purchasing decision, as mentioned in sub-section 2. The importance of surveys like JD Power are an indication that buyers are concerned about the quality of the product as well as the running cost.

The force of the buyers is considered strong, since the offerings of the various OEMs is, to a large degree, identical in the perception of the potential buyers, taking into consideration the top ranked buying decisions. The industry's toolkit to convince customers to decide for their brand is limited to price and attractive running costs, which has an immediate impact on the profitability of the industry. Therefore, OEMs will need to invest heavily in customer retention to prevent customers deciding for another brand; the next time they might consider the brand again being years in the future.

11.4 The Threat of Substitutes

To define the threat for substitutes, it is key to describe the exact purpose and reason for buying a vehicle. The prime purpose is to get the driver (and its passengers) from a specific location to a destination. Owning a vehicle is costly (initial investment, depreciation and running cost). Certainly, in cities the possession of a vehicle is extremely challenging, due to a lack of parking spaces and the traffic congestions in and around cities. In this assessment, we only consider "mobility" the prime reason of buying a vehicle. The force of the potential substitutes is defined based on the following sub-forces:

- Switching cost
- Attractive price-performance trade-off

Further details regarding the substitutes, as well as the global changes regarding mobility, have been explained in Chapter 7 – Megatrends in the automotive industry.

1. Switching from a product (defined as “mobility”) to another product which offers the same, but in a different fashion, is relatively straight forward. One might even argue that not owning a vehicle is more interesting from a hassle and financial view point. Certainly, switching from one provider to the other is easy, and there is no such element available as a “lock-in” of customers from a manufacturers point of view.

2. Compared to the first point, the second sub-force is more challenging to answer. The main reason is the variety of products that offer “mobility”. To answer this question, the following categorization will be made when it comes to the product and, more importantly, how the product “mobility” is offered to the customer.
 - **Vehicle ownership** (incl. leasing and financing). The end-customer has, at any given point in time, access to the vehicle.
 - **Vehicle short term ownership**. The end-customer is owning a vehicle (brand and model are not always at the choice of the customer) for a given period. It is likely that the selected vehicle suits the need of the customer at that moment. This means that the product “mobility” is even more specific, addressing the individual needs of the customer.
 - **Mobility as a Service**. The vehicle isn’t owned by the person that uses the product at a given point in time. The vehicle is owned by a fleet owner or a private person that provides the tool that enables the service (car sharing). In this case, the tool is the vehicle and the services are executed by the driver or customer. An alternative is ride sharing, where both the tool and the service is provided by a third party. Examples are BlaBlaCar and UBERPool. It is debatable whether taxi services (incl. Uber) are part of this group.
 - **Alternative Transport**. In cities, alternative transport may be the prime mode of transport, bikes and public transport included. However, from the view point of the automotive, these are alternative means of transport that will directly affect the industry, since no vehicle is involved.

Considering the above mentioned different product offerings, 3 out of 4 persons require a vehicle, which may offer a good position for OEMs. However, in 3 out of 4 (vehicle short term ownership Mobility as a Service and Alternative Transport), there

is no direct link between the end-customer and the brand that is marketed by the OEM. Since the value addition in the production process is declining for the OEMs to less than 20%^[89]] and retail activities remain their strong point, including marketing of the brands, it seems likely that OEMs are in a position where this force is strong.

Overall, the threat of substitutes is a moderate to strong force. This is mainly driven by the fact that there is no lock-in of the customer, and the current market place is flooded with alternatives to the product “mobility”. Although these services might use vehicles, there is no direct connection between the vehicle used to execute the service and the brand. If this brand awareness is less, or even non-existing, it is unlikely that the brand will enter the first stage of any purchase, decision-making process. Companies will buy the vehicles as assets to execute services will leverage their power, thus have a direct impact on the profitability of the industry.

11.5 Rivalry

Rivalry amongst competitors is likely to be the most visible force that limits the industry’s profitability. The degree to which this happens is depending on two major strengths, according to Porter:

- *Intensity* of the rivalry
- *Basis* of the competition

These following sub-forces will be assessed to determine whether this 5th force is strong or weak:

- Competitor landscape
- Industry performance
- Exit barriers
- Competition base:
 - Price
 - Other dimensions
- Fixed cost and capacity

The above mentioned sub-forces will be assessed to understand the rivalry in the automotive industry.

1. The initial sub-force is based on the landscape that defines competition in the automotive industry. Although the automotive industry is larger than just the OEMs, only the vehicle manufacturers and brand owners will be assessed. It is the general consensus of economists that an industry where a dominant industry leader is absent the rivalry amongst the (numerous) equally sized competitors is strong. Taking into consideration the revenue and sales volumes of 2016, it may be included that although there are strong OEMs, these OEMs are very similar in size; both in revenue and in volume.^{[90][91]} The automobile manufacturers compete with each other, not with only one industry leader. This sub-force is considered strong
2. The annual growth of an industry is important to determine whether the market is mature. In case of a mature market, the year-on-year growth is small, resulting in increased fights among competitors for market share. The industry growth is measured in production volume over the years 1995 – 2015. The performance of the automotive industry is related to the number of vehicles produced.^{[92][93]}

| Year | World-wide production volume (in millions) | YoY (%) |
|-------------|---|----------------|
| 2016 | 72.105 | 4,9% |
| 2015 | 68.539 | 1,1% |
| 2014 | 67.782 | 3,0% |
| 2013 | 65.745 | 4,1% |
| 2012 | 63.081 | 5,0% |
| 2011 | 59.897 | 2,8% |
| 2010 | 58.239 | 18,0% |
| 2009 | 47.772 | -10,6% |
| 2008 | 52.841 | -0,7% |
| 2007 | 53.201 | 6,2% |
| 2006 | 49.918 | 5,8% |
| 2005 | 47.046 | 5,3% |
| 2004 | 44.554 | 5,8% |
| 2003 | 41.968 | 1,5% |
| 2002 | 41.358 | 3,7% |
| 2001 | 39.825 | -3,5% |
| 2000 | 41.215 | 3,5% |
| 1999 | 39.759 | 4,6% |
| 1998 | 37.925 | -1,4% |
| 1997 | 38.453 | N/A |

Table 3: World-wide vehicle production of passenger cars 1997 ~ 2016 ^[93]

The average growth is 3,1% over the last 19 years, starting from 1997. The median for the same period is 3,7%. This timeframe includes the crisis of 2008 and 2009, resulting in a production decline of 11,3% in 2 years. Considering the limited growth potential, based on the worldwide production, this sub-force is considered strong.

3. The OEM's largest revenue contribution comes from the sales of the produced vehicles. Considering the 3 premium German brands, the revenue contribution from sales of passenger vehicles (truck, vans and busses are not included) as percentage of the total revenue is indicated in the following table.

| Brand | Total Revenue 2016 (million €) | Revenue Vehicles 2016 (million €) | Revenue contribution vehicles on total (%) |
|----------------|--------------------------------|-----------------------------------|--|
| BMW | 94.163 | 86.424 | 91,8% |
| Daimler | 153.261 | 89.284 | 58,3% |
| Audi | 59.318 | 58.587 | 98,8% |

Table 4: Key financials indicators of 3 German OEMs in 2016 – BMW, Daimler and Audi ^{[94][95][96]}

With the exception of Daimler, BMW and Audi are reliant almost solely on the revenue streams generated by the sales (and production and assembly) of passenger cars. Although, it is important to note that the remaining revenue contribution of Daimler is generated by the production and sales of vans, busses and trucks. ^{[94][95][96]}

The exit barrier is high for OEMs, if not impossible, because the business structure is solely based on the manufacturing and sales of motor vehicles. This will force OEMs to even consider lower profits, but to keep a certain production level. See also sub-force 5: Fixed cost and capacity. This results in a strong sub-force.

4. Besides the *intensity* of the rivalry, the base of the competition is also a crucial factor. Porter defines competition based on price and “other dimensions” like product features, support services and brand image among others. The automotive market is a concentrated and stable market, which leads to a coordination of prices. ^[97] OEMs monitor the pricing strategy of their competition and do not avoid potential price cuts to retain market share. Since the product, defined as “mobility” in previous paragraphs, is to a large degree identical amongst the competitors, price is a key factor defined in the industry’s marketing mix. The price sensitivity of the buyer confirms the underlying of the rivalry between the OEMs. However, it should be noted that the “other dimensions”, like brand image and vehicle attributes, also play a role, enabling OEMs to differentiate themselves, resulting in a less capped profitability. In the latter, the price sensitivity and willingness of the customer to pay for a specific attribute is again proven according to Marc Fetscherin et al. ^[98]

5. The fixed cost and capacity play a significant role in industry structure and the profitability of the industry. The fixed costs arise, among others, from investments in new technologies, production facilities, depreciation and amortization of other tangible, intangible, and investment assets.^{[94][95][96]} Together with the previously mentioned capacity of the automotive, these factors limit the flexibility of the industry and force companies to even cut prices below their average cost, increase their customer base (price sensitivity) and still covering the high fixed costs. The capacity utilization is globally around 80%, recovering from an all-time low of around 33% in 2009. The 80% is considered a long-term average. However, the rate is region dependent. The US and Germany are well above the 80%, whereas countries like Italy and France are well below with a very conservative outlook to increase the rate.^[99, 100] This is putting pressure on the profitability of (local) OEMs. The region dependencies and variations in the utilization of the production plants, combined with the high fixed costs associated with the industry, results in a strong sub-force.

11.6 Demand-side Sub-forces

Porter's 5 Forces are considered a crucial tool of defining the structure of the industry. However, the hypothesis that underlines this paper, forces us to investigate the demand-side (end-customer) in more detail. The following sub-forces, which are not part of the forces original identified by Porter, will be used as a tool to investigate the demand-side of the automotive industry:

- Search for substitute
 - New entrants encouraged
1. The product of the automotive industry has been identified as "mobility". As such, there are a multitude of options available to end-customers regarding ground transportation. Air or sea transportation are not considered, although air transport is, to a certain degree, a competitor of the automotive industry. The niche position of car-sharing is especially important for the automotive industry.

Together with the impulse towards (semi-)autonomous driving, this will have a major impact on the number of vehicles per household, the ownership models and the utilization rate of vehicles. ^[101]

The indication is clear that the end-customer of mobility is looking for alternatives which meet the individual requirements, balanced between cost and ease of use. Major factors that boost the search for substitutes are both demographic (Millennials and Gen Z) as well as the strong, projected urbanization of the world.

2. New entrants are facing challenges entering the automotive market as assessed in paragraph 11.1. An example of a new entrant which is supported by the public is Tesla. The company was established in 2003 and offers solely electrical vehicles. With the recently launched Model 3, Tesla is now entering the mass volume market, ramping up to 500,000 vehicles per year by the end of 2018. The unique product characteristics of all Tesla models are the electric powertrain and the enhanced, futuristic connectivity features of the vehicle like Over-The-Air update of software. End-customers seem to encourage the entrée of Tesla in the automotive industry, resulting in over 500.000 pre-orders for a vehicle which people have never driven, or likely a brand that they haven't owned before. Although it is a qualitative assessment and only remotely based on scientific evidence, it is indicating that the end-customer is enthusiastically embracing a new entrant like Tesla. Although, Tesla is more a traditional OEM offering mobility in only a slightly different fashion. Other new entrants are car- and ride-sharing initiatives like Uber, Lyft, and BlaBlaCar. Today, the top-5 ride sharing companies have a combined market capitalization of approximately \$120 billion and empirical research shows that the utilization of ride sharing alternatives increased by 200% in a year, from Q4 2015 – Q4 2016. The survey was executed in the United States, questioning 5.475 participants. ^[102]

The conclusion, on qualitative grounds, is that the demand-side sub-forces are also strong. The end-customer is open to alternative modes of transport in a more traditional way like Tesla, or complete new (non-)ownership models like the previously explained NMS'.

11.7 Conclusion of the Automotive Industry Assessment according to PF5

As a result of quantifying the strength of the individual forces, which jointly form Porter's Five Forces, it will become clear which part of the business ecosystem is potentially influencing the profitability of the industry in a negative way. According to Porter, this may eventually lead to a business structure change. Therefore, the focus is placed on the forces which are indicated as, "moderate" or, "strong".

The quantification of the forces in this chapter demonstrates that the following areas of the business structure require attention by industry business strategists, or decision-makers, and are also deemed to be key in answering the research question of this Thesis following the "Influence Model":

- The cost for customers to switch from one brand to another is relatively low. With the exception of the residual value, there is no genuine lock-in state of the customer. This may result in the industry also being more vulnerable to other forces, like the "threat of substitutes".
- The power of the buyer is considered strong, assessing all sub-forces except for the "volume of purchase". In all other areas, the buyer (e.g. end-user) can influence the profitability of the industry or a specific brand. The strength of this sub-force is mainly driven by the fact that the buyer is price sensitive and the offered product is largely undifferentiated. Both factors are a risk for specific brands.
- If the threat of substitutes is considered, it can be observed that the entire profitability of the automotive industry is potentially at risk.
- The demand-side sub-forces, which are added to the standard 5 forces of Porter's model, are confirming that, especially new customer generations, are open for cost-effective alternatives.
- The high rivalry amongst the OEMs is leaving not too much space to invest in new business models. This is capping the profitability now and in the future.

The overall conclusion is that mainly forces, indirectly influenced by the buyer, are strong and limiting the profitability of the automotive industry. This might even result in a change of business structure. An overview of the assessment of the automotive industry can be found in Table 5: *Results of Porter's 5 Forces Assessment – Automotive Industry*

| FORCE | SUB-FORCE | POWER OF SUB-FORCE | POWER OF FORCE |
|----------------------------------|---|-------------------------------|-----------------------|
| THREAT OF ENTRY | Supply-side economies of scale | Weak | Weak |
| | Demand-side benefits of scale | Weak | |
| | Customer switching cost | Moderate/Strong | |
| | Capital Requirements | Weak | |
| | Incumbency advantages independent of size | Weak | |
| | Unequal access to distribution channels | Weak | |
| | Restrictive government policy | Weak | |
| | Expected retaliation | Weak | |
| | THE POWER OF SUPPLIERS | Concentration of the industry | |
| Dependability of the industry | | Weak | |
| Switching cost | | Weak | |
| Differentiating offerings | | Weak | |
| Substitutions | | Weak | |
| Forward Integration | | Weak | |
| THE POWER OF THE BUYERS | Volume of purchase | Weak | Strong |
| | Undifferentiated | Moderate/Strong | |
| | Switching cost | Strong | |
| | Price sensitivity | Strong | |
| | Quality | Strong | |
| THE THREAT OF SUBSTITUTES | Switching Cost | Strong | Strong |
| | Attractive price-performance trade-off | Strong | |
| RIVALRY | Competitor landscape | Strong | Strong |
| | Industry performance | Strong | |
| | Exit barriers | Strong | |
| | Competition base | Moderate | |
| | Fixed cost and capacity | Strong | |
| DEMAND-SIDE SUB-FORCES | Search for substitute & New entrants encouraged | Strong | Strong |

Table 5: Results of Porter's 5 Forces Assessment – Automotive Industry

Chapter 12: Business structure assessment mobile phone industry (Ytsma)

The mobile phone industry has changed significantly in the last 20 years. In this assessment of the mobile phone industry, we will focus predominantly on the changes noted by the manufacturers. Similar to the valuation of the automotive industry, the assessment will be based on Porter's 5 Forces and it is viewed from a manufacturer's viewpoint. However, this assessment will be a more dynamic in order to understand the forces, the change of business structure as a result of the forces and the implications for the industry players. The period selected focuses on the years between 2007 and 2013. The reason for selecting this specific 6 year period is clearly visible in the following graph.

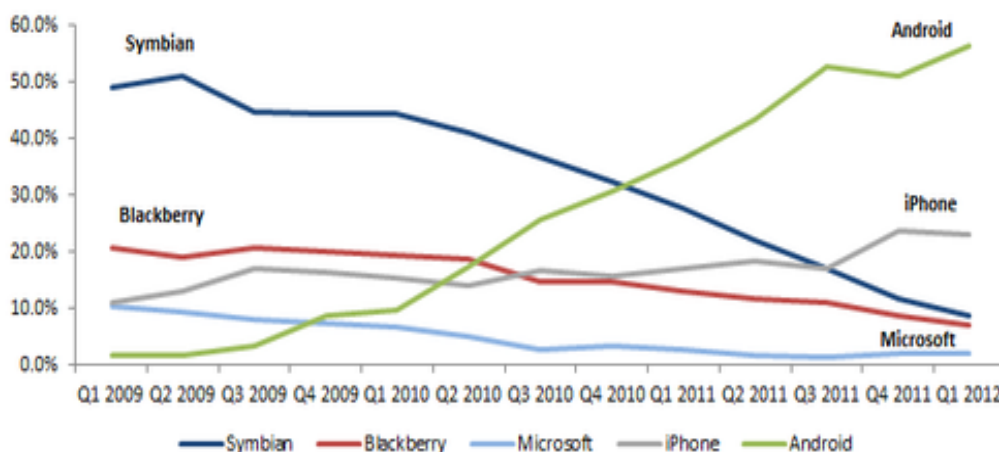


Figure 28: Global Smartphone OS Market Share (%). ^[103]

The following can be noted from the graph:

- The decline of Nokia's Symbian OS started as early as 2007
- RIM's (BlackBerry) decline started 2 years later
- The big winner of Nokia's loss of market share isn't Apple's iOS, but Android.
- The introduction of new Apple products results in a market share burst and a drop on smartphones that are equipped with an Android operating system. However, the overall share of Android-based smartphones is increasing year-on-year.

Besides the change in market shares, driven by the change of preferred operating systems, the industry also moved away from feature phones to smartphones. Feature phones (later referred to as mobile phone) are defined as phones with (very) limited capabilities, in comparison to smartphones.

This resulted, among others, in the following major changes from a (smart)phone manufacturer point of view:

- Traditional players that dominated the market in the pre-smartphone era, essentially before 2005, faced immense challenges from 2005 onward.
- New hardware manufacturers emerged from China, after a strong consolidation in Europe.
- The focus on hardware specifications moved to focus on applications and the delivery of the content to the end-customer.
- The market for smartphones was growing with double digit growth figures, whereas the markets for feature phones was declining. ^[104]

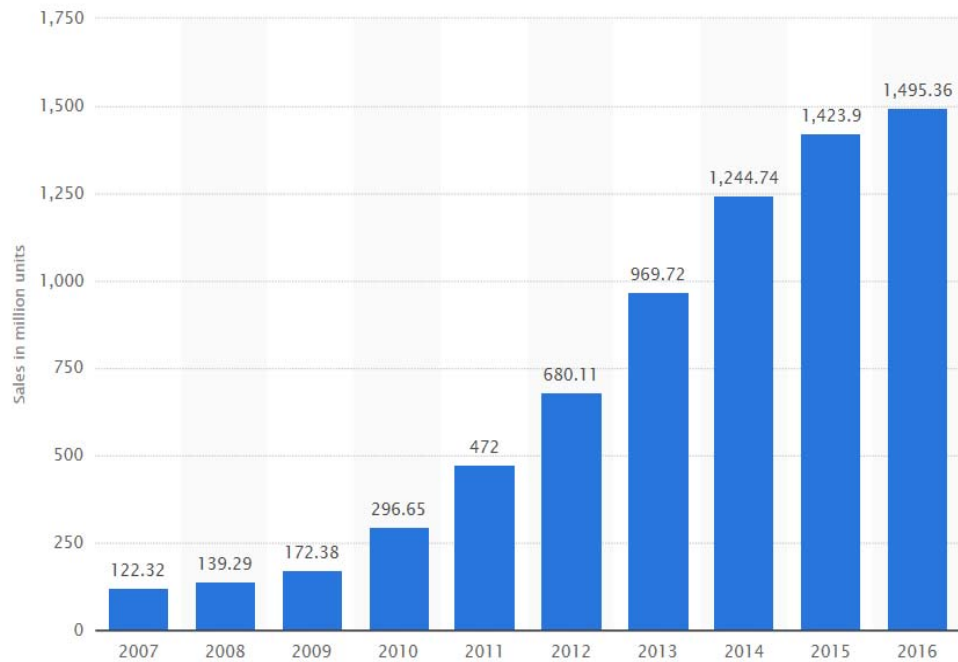


Figure 29: Smartphone sales 2007 - 2016. ^[104]

12.1 Threat of Entry

12.1.1 Supply-side economies of scale

In the mid-2000s the numbers of mobile phones reached 1.100 million units in 2007. The volume of smartphones only represented 10% of the total volume. With these modest sales figures, new entrants had a chance to enter the smartphone market. The incumbents benefit the economy of scale from a supply perspective, but it seems that this scale benefit wasn't applicable to the supply of the necessary screens and more powerful graphics processors that power the smartphones. As a result, entrants had an opportunity to enter and this became increasingly visible in the sales figures after 2007. This resulted in a drop of Nokia's mobile device sale in 2007. ^[105] The prime reason for Nokia's decline in sales numbers being the delay of introducing phones with a large touch screen. Although smartphones represented in 2009 and 2010, a share of less than 20%, the business changed and new entrants like Samsung, LG, HTC and Apple entered the market. The change from feature phones to smartphones, with (capacitive) touch screens, was enabling new entrants to access the mobile phone market. The change in technology wasn't protecting the incumbents by supply-side economies of scale. In today's smartphone market, the supply-side economies of scale sub-force is considered weak. The observation is that the strength of the force is also depending on the agility of the market to move to new technologies, influenced by the inability or ability of the incumbents to react. As a result, this sub-force is considered moderate to strong in the mid-2000s.

12.1.2. Demand-side benefits of scale

This so-called network effect plays a key role in today's smart phone industry. Both at brand level as well as at application level. The perceived image of a brand like Apple or Samsung is very strong and people tend to stick to the brand they have selected initially. Brand loyalty is above 80% with Apple's iPhone and even a more generic brand - from an operating system perspective - like Samsung reached a customer retention percentage of more than 65%. People trust the brand and value the brand image. Another aspect is the demand-side benefits from an application point of view. The recent past has shown that the operating system has been decisive in the purchase decision of end-customers. The main reason behind selecting a specific operating system is the support of smart phone based application, usually referred to as "apps". It has been frequently mentioned that the

relative small number of “apps” available on both RIM (Blackberry) and Microsoft operating systems were a downturn for end-customers to select hardware that runs the before mentioned operating systems. This sub-force is currently considered strong while assessing the smart phone industry. However, the demand-side was not strong enough to keep the rendition rate for companies like Nokia and Blackberry at an acceptable level in the mid-2000s. The conclusion is that this sub-force was strong and is now moderate. The main driver for that change is the operating system which defines the availability of “apps”.

12.1.3 Customer switching cost

The definite costs of switching from one mobile phone brand to another was, in the early years of the new millennium until the rise of the smartphone, minimal. Today, there is still no actual cost involved, when switching from one brand to the other. However, since smartphones are integrated in the end-customer’s daily life, share information with other connected devices and the way these devices operate are becoming identical, the lock-in is increasingly stronger. Not necessarily from a financial view-point, but merely from a user experience.

The sub-force was strong before the introduction of the smartphone, since the incumbents were not protected against possible new entrants by high or relative high switching cost. However, due to the lock-in, the strength of the sub-force reduced to weak.

12.1.4 Capital requirements

The capital requirements to enter the (smart)phone market have been and still are very high. Capital is required to fund the development of a smartphone, invest in the Bill of Material (BOM) before production has started, setup and finance a distribution channel, which also include the marketing activities and fund potential start-up losses. The start-up losses are expected to arise from discounting the retail price to gain market share in favor of the continuation of the production. The cost to manufacturer Samsung’s latest S8 is estimated at \$307,50 (€258,40), including \$5,90 of manufacturing expenses. ^[106] With a retail price of \$720 (€603,82) this leaves a margin in the entire distribution chain of \$412,50 (€345,94). This gross margin will need to cover the amortized R&D costs, sales and marketing expenses and fund the distribution channel.

12.1.5 Incumbency advantages, access to distribution channels and retaliation

The (smart)phone industry is known for its patents application and the infringements of these patents leading to numerous lawsuits. Another example of the incumbency advantages is the merger or acquisition of companies that hold technology patents. Both are examples that incumbents have a definitive advantage over new entrants, which isn't necessarily captured in sheer size or market volume, but more in technologies. Studies show that the number of patents, related to the mobile phone industry, are increasing rapidly. In 2012, 20% of the granted patents were coming from this industry. Overall, the (smart)phone industry counts for 16% of all active patents. The patents are increasingly used as a defense mechanism. ^{[107][108]}

The distribution of (smart)phones is dominated by two channels; the "closed" operator distribution channel and the retailer distribution channel. The latter surpassed the previous distribution channel in 2014. ^[109] In both cases, the B2C partners of the (smart)phone manufacturers regulate to a large extent the phones that will be displayed. The (smart)phone manufacturers never had a strong, direct relationship with the end-consumer. The only exception is Apple through their presence in the high street and Apple stores. As an entrant, it will be challenging to convince retail and telecom providers, representing the closed distribution, to give shelf space in shops or combine (smart)phones of entrants with attractive contracts.

The importance of the phone divisions is significant for both Apple and Samsung, as the current top listed smartphone manufacturers. The sales of Apple's iPhone contribute for 62,9% to Apple Corps Ltd's revenue in Q2 2017. The smartphone division of Samsung Electronics Co., Ltd., referred to as IM (IT & Mobile communications), contributed 47,4% to the overall revue in the same quarter. ^{[110][111]} Since the sales of smartphones play a very significant role in the value creation of both companies and the profit is also substantial (28,8% for Samsung's overall operating profit in Q2 2107), retaliation is expected.

Based on the assessment of the previous sub-forces, the conclusion is that these are weak.

In summary the threat of new entrants, potentially limiting the profitability of the incumbents, has moved from moderate to strong. The shift is largely caused by the fact that the sub-forces "demand-side benefits of scale" and the "customer switching

costs” moved the force into a more favorable position for the incumbents. Lock-in of customers exists in today’s smartphone market where it didn’t in the mid-2000s, allowing customers to switch to new entrants that offered innovative technologies (i.e. smartphones with capacitive touch screens) at an earlier stage than the incumbents at that time.

12.2 The Power of Suppliers

In this paragraph, the following sub-forces applicable for the (smart)phone industry will be assessed:

- Concentration of the industry
- Dependability of the industry
- Substitutions
- Forward Integration

12.2.1 Concentration of the industry and dependability of the industry

In the mid-2000s, the (smart)phone industry was dominated by a top 3 of hardware manufacturers that represent more than 65% of the market (Top 3 in 2007; Nokia, Samsung and LG). In 2016, the top 3 represented 43,8% of the market. ^[112] The top 3 was represented by Samsung, Apple and Huawei. Although there is a drop of market share, covered by the top 3, and the number of new, predominantly Chinese entrants have increased.

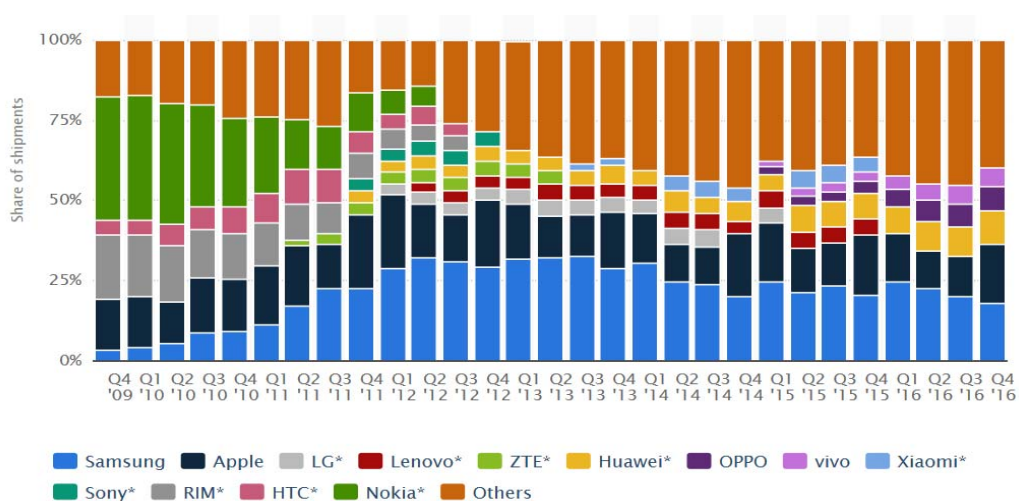


Figure 30: Global smartphone market share 2016. [113]

Although the number of smartphone manufacturers has increased over-time, the supplier industry concentration isn't in favor of the suppliers. The high volumes of components demanded by the smartphone manufacturers, the importance of the mobile phone industry for these suppliers, and the large number of the suppliers to the mobile phone industry result in a weak to moderate sub-force.

12.3 The Power of Buyers

Similar to the assessment of the automotive industry, the end-customer will be viewed as the final customer of the smart phone industry. Although, the retail and the telecom industry are the direct customers of the (smart)phone industry. In the next paragraph, the following sub-forces will be considered:

1. Volume of purchase
 2. Undifferentiated
 3. Price sensitivity
-
1. The volume of purchase of is small. For private usage, people rarely own 2 or more smartphones. The cycle time for replacing the smartphone depends heavily on the brand. But considering both, the power of the buyer is weak when it comes to the volume of the purchase.

 2. *Undifferentiated* - The principal functionalities of the smartphones are to a certain extent the same. But end-customers seem to be very keen to stick with a brand. iPhone users especially spend the least amount of time reviewing the offerings of other manufacturers.^[114] iPhone buyers seem to be attracted by the Apple-brand rather than the differentiating power of the device itself. According to a recent study by Dospinescu, Nicoleta & Beatrice Florea, Dana. In 2016, Apple is selling a mix of hopes, dreams and aspirations.^[115] The importance of the brand reduces the strength of the force significantly, even though the rudimentary functions of the various smartphone manufacturers are identical. The sub-force is considered moderate.

3. *Price sensitivity* - Today's mobile phone user is increasingly price sensitive according to a survey carried out by Deloitte. In 2014, customer rated "price" as the main argument to select a phone. In the previous year, brand and reliability were the top-rated decision criteria. ^[116] This confirms the maturity of the market and the rise of cheaper phone, especially for the Indian and Chinese market. The sub-force is considered strong in today's world.

The combination of the above sub-forces results in a moderate strength of the force. The current industry leaders benefit from the value of the brand, but are pressurized by the price sensitivity of the market. The latter certainly accounts for the emerging markets. ^[117]

12.4 The Threat of Substitutes

To identify the risk for substitution, it is key to understand the role of the smartphone. The phone became a tool to communicate with friends and family in very different ways and dramatically altered our usage of the internet and purchasing behavior. Statistics show that:

- Half the world's population is now using a smartphone;
- More than half of the world's web traffic now comes from mobile phones
- One in five of the world's population shopped online in the past 30 days ^[79]

Studies show different figures when it comes to the hours spent using a smartphone, mainly since multiple devices are used to access the same media and content (i.e. smartphone and tablet), but the trend is clear; the smartphone plays a key role in our daily time spent. The phone is also becoming a more integral part of our life when it comes to other activities (i.e. second screen, navigation for city exploration, tracker of exercise activities, etcetera). The risk that the smartphone is replaced by another device in the foreseeable future, combining the features of current smartphones, is very unlikely. Attempts to (partially) replace the smartphone have been introduced to the market. Examples being the smartwatch, and the smart-glasses (i.e. Google Glass), but the combination of features and the transportability of the smartphone were keys to the ongoing success of the smartphone. In the mid-2000s, the features of the phones changed dramatically adding social media, content, and camera features to the current smartphone.

The smartphone is viewed a substitute of the feature phones that dominated the world in the mid-2000s. At that moment, the force was stronger than it is considered today. Industry leaders like Nokia dominated the market and were aware of the introduction of the features of the smartphones like the Apple iPhone 3. However, due to a combination of top managers that were led by fear, the pressure of the shareholders, and the middle managers that were afraid of their peers operating at the same level, the innovation process was disrupted and the capabilities and strength of the organization over-estimated. The lack of the communication between the two management layers eventually led to a disconnect with the market demand and the competitors landscape. ^[118] Although Nokia had an app-store and smartphones with a (resistive) touch screen, the company was focusing on the technical capabilities of the engineers rather than the demand of the end-customer for content. The conclusion drawn is that the threat for substitutes, or at least a disruptive change of feature characteristics of the phone, was strong in the mid-2000s. The today's force, based on the strong interconnect with the end-customer's daily life, is considered weak.

12.5 Rivalry Among Existing Competitors

The rivalry among competitors is assessed based on its intensity and the basis on which they compete in the markets. Considering that the basic functionality of smartphones is to a large extent identical, and the market is increasingly price sensitive, the basis on which the competitors compete is price. This has an immediate, negative influence of the potential profitability of the industry. While, there is no industry leader dominating the market and the number of brands of a significant market share is increasing as a result of the growing demand in the emerging markets China and India, the intensity of the rivalry is increasing. Departing the smartphone industry is no option for brands like Samsung and Apple. The revenue and profit generated by the sales of the smartphones can't be ignored. The value of Apple is heavily depending on the sales performance of the iPhone. The fierce competition of rivals like Samsung and the importance to innovate is likely putting a cap on the profitability on Apple and as such the entire industry. ^[119] On this basis, the force of "rivalry among competitors" is considered strong, which is limiting at mid to long term the profitability of the industry.

12.6 Conclusion of the Mobile Phone and Smartphone Industry Assessment according to Porter's 5 Forces

The assessment of the mobile phone industry, using Porter's 5 Forces and covering the mid-2000s and mid-2010s, resulted in the following noteworthy observations:

- The power of the buyer has not changed significantly between the mid-2000s and the mid-2010s, mainly as a result of the fact that the purchase pattern (e.g. price sensitive and one phone per purchase activity) has not altered.
- The strength of forces, indirectly influenced by the buyer, have changed in the same decade. Noticeable forces are:
 - Customer switching cost
 - The threat of substitutes
- The technology shift from feature phones to smart phones opened the market for new entrants, not protecting the incumbents.

The conclusion is that mainly forces, indirectly influenced by the buyer, were strong in the mid-2000s, resulting in a business structure change. The new business structure is characterized by different strengths of the forces, indicated in Table 6: *Results of Porter's 5 Forces Assessment – Mobile phone Industry*

| FORCE | SUB-FORCE | MID-2000S | MID-2010S |
|-------------------------------|---|------------------|------------------|
| THREAT OF ENTRY | Supply-side economies of scale | Moderate/Strong | Weak |
| | Demand-side benefits of scale | Strong | Moderate |
| | Customer switching cost | Strong | Weak |
| | Capital Requirements | Weak | Weak |
| | Incumbency advantages independent of size | Weak | Weak |
| | Unequal access to distribution channels | Weak | Weak |
| | Restrictive government policy | Weak | Weak |
| THE POWER OF SUPPLIERS | Concentration of the industry | | |
| | Dependability of the industry | | |
| | Differentiating offerings | Weak/Moderate | Weak/Moderate |
| | Substitutions | | |
| | Forward Integration | | |

| | | | |
|--|--------------------|----------|----------|
| THE POWER OF THE BUYERS | Volume of purchase | Weak | Weak |
| | Undifferentiated | Moderate | Moderate |
| | Price sensitivity | Strong | Strong |
| THE THREAT OF SUBSTITUTES | | Moderate | Weak |
| RIVALRY | | Strong | Strong |

Table 6: Results of Porter's 5 Forces Assessment – Mobile phone Industry

Chapter 13: Defining the Connected Car Ecosystem (Ytsma)

13.1 Overview of the Ecosystem

To define exactly the very part of the market – in this case the connected car ecosystem and the offering of the 3 leading German automotive OEMs – that is needed to answer our research question in a straight forward and educated way is of paramount importance.

Moreover, a definition to be able to integrate into the research model, leading into building the Offerings leg. To begin with, there is no standard definition for the technology enabling the concept of the “Connected Car”, nor is there the feature-set offered to the potential beneficiaries of the “Connected Car”. This results in wide-spread estimations with regards to the number of connected vehicles by a particular year predicted, the estimated value contribution of the Connected Car to the automotive industry, as well as the regional differences that play an important role by adapting “Connected” services.

The above is clearly demonstrated by the widespread financial figures, concerning the Connected Car business, produced by consultancy companies like Gartner, KPMG and Frost & Sullivan. The spread in estimations, both number of vehicles connected as well of the features offered, force us to define the Connected Car based on 3 parameters:

- The connected technology used; the means by which data is transmitted from the vehicle to a back-end and vice versa.
- The features or services offered.
- The beneficiaries of the Connected Car.

For the definition of the Connected Car, the classification provided by the research firm Gartner is adopted; The Connected Car is, “an automobile that is capable of bidirectional wireless communication with an external network for the purpose of delivering digital content and services, transmitting telemetry data from the vehicle, enabling remote monitoring and control, or managing in-vehicle systems.” ^[120]

13.2 In-vehicle hardware

The in-vehicle hardware consists of an apparatus that has the ability to communicate vehicle telemetry data to an IT-infrastructure and receive data from the same IT-infrastructure back-end. “There are three primary integrations of connected systems: embedded, tethered, and smartphone.” [121]

The technical presence of this apparatus can vary from vehicle to vehicle. The following mainstream solutions are currently marketed in Europe:

- A communication module integrated into another ECU that is part of the vehicle architecture. For example, integrated in the infotainment head-unit of the vehicle.
- A retrofit solution, mounted in the vehicle, enabling communication between the vehicle and the IT back-end. Usually, the hardware is connected to the OBD port of the vehicle. Although it is unlikely that these solutions will prevail over time, they are considered a part of the connected car offerings.
- A stand-alone apparatus with the specific purpose of communicating vehicle data. In some literature, these specific devices are referred to as Telematics Control Unit (TCU).

In this Thesis going forward, all apparatus installed in vehicles enabling the bidirectional communication between the vehicle and an IT infrastructure back-end are indicated as TCU. Brought-in solutions like a smartphone or a Personal Navigation Device (PND) are not considered in this Thesis. Prime reasons for not considering the above-mentioned devices are:

- The brought-in solutions are not transmitting genuine vehicle telemetry since they are not directly connected to the data transmission busses in the vehicle (e.g. CAN-bus or Ethernet). In case these devices are receiving data, the main purpose is to provide a pipe to send the data from the in-vehicle infrastructure to the IT back-end.
- Brought in devices and the apps that run on these devices are only very slightly by OEMs. To answer the research question, the focus is only on solutions that are controlled by the OEM (directly or indirectly) and have the opportunity to generate value to the OEM and its ecosystem.

13.3 Data communication

The communication between the TCU and the IT-infrastructure is based on existing technologies used for consumer electronics and defined by non-governmental bodies like GSMA (mobile networks) and Wi-Fi Alliance (Wi-Fi). Future technologies like Dedicated Short-Range Communications (DRSC) are not considered since the expectation is that this technology will be used for Vehicle-to-Vehicle and Vehicle-to-Infrastructure communication. ^[122] This technology will be used for safety related features and (semi)-autonomous driving

The communication between the TCU and the IT-infrastructure can be embedded or tethered. In the latter, another device (i.e. smartphone), is used to establish the communication between the TCU and the IT-infrastructure. It will be key to note that the smartphone is solely used for communication and not for providing any additional data, or an application layer. In case of an embedded setup, the TCU communicates directly with the IT-infrastructure.

13.4 Off-board technology or IT-infrastructure

The definition of the off-board technology is an IT-infrastructure (on-premise, cloud or hybrid) that is capable of:

- Receiving a vast amount of (real-time) vehicle data, referred to as vehicle telemetry data
- Storing of the following data among other:
 - Vehicle telemetry data (directly)
 - Usage patterns (indirectly)
 - (Privacy) information from the Connected Car Ecosystem beneficiaries or users.
- Cleansing and aggregation of this data
- Enabling beneficiaries to enrich the data, extract information from the data and develop services and products based on the data gathered.

The off-board technology will need to comply with all regional regulations with regards to data privacy.

The following figure shows the position of the IT infrastructure as part of the Connected Vehicle Ecosystem.

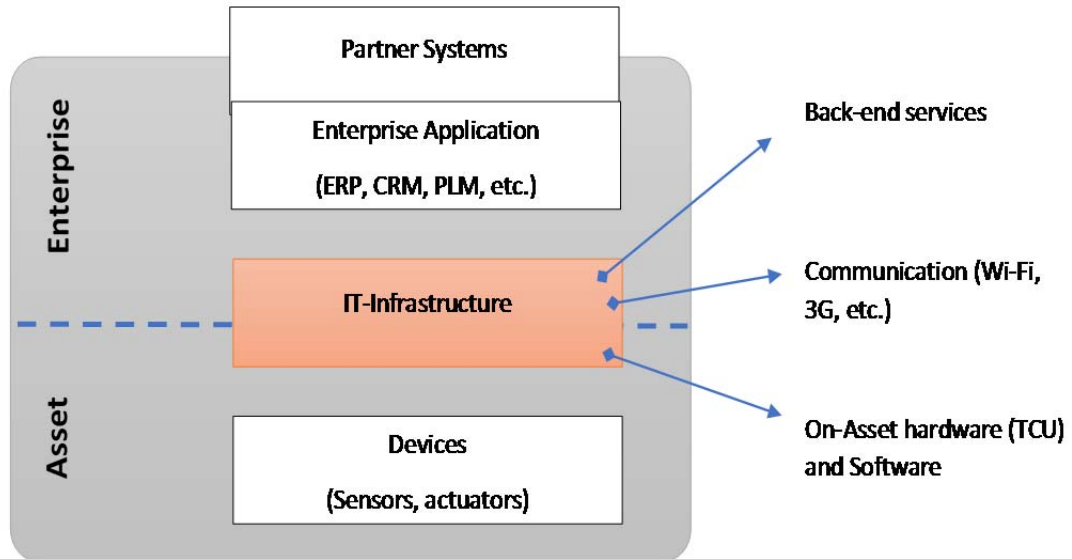


Figure 31: IT Infrastructure of a Connected Vehicle Ecosystem. ^[123]

- *Cyber security*

Cyber security is a big issue both directly, and indirectly to any Connected Car Ecosystem. “The issues mentioned concern data security, legal & liability, safety, economy and ethics. We cluster these elements in Safety, Security and Liability. These issues are directly related to the consumer trust in the connected car” ^[124]

The direct risk applies to the fact that a vehicle can be hacked. In the recent past numerous vehicles are hacked resulting in receiving real-time vehicle data or worse; controlling ECUs in the vehicle. ^[125] The main reason for this vulnerability is the fact that vehicles are traditionally not designed, from an electrical perspective, to be cybersecure. As a result, “firewalls” are not in place. Companies like Intel, IHS and the NCC Group have identified potential cybersecurity risks. An overview of the potential attack areas is shown in the picture below.

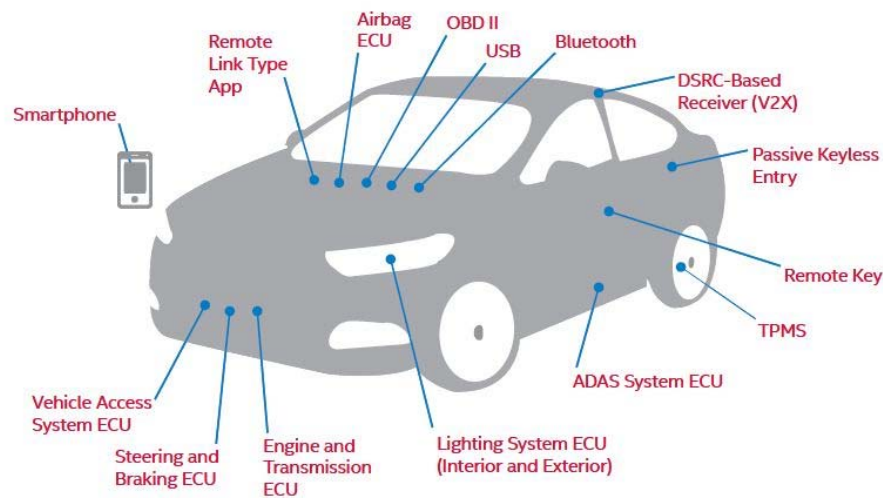


Figure 32: Most hackable and exposed attack surfaces on a next-generation car. ^[126]

This direct cybersecurity threat has an immediate and significant impact on the vehicle, its occupants, and the surrounding of the vehicle. Irrelevant of the damage dealt to the brand if cybersecurity issues continue to appear.

A second, indirect cybersecurity risk is related to the perception of the user or owner of the vehicle. Since this persona is deemed to be one of the most important beneficiaries of the Connected Car Ecosystem in terms of (perceived) value contribution, it is an absolute necessity to accommodate the (latent) demands of this group with regards to privacy and cybersecurity. The following Hierarchy of Needs (HON), originally developed by Abraham Maslow in order to portray the progression of an individual's pursuit to meet personal in a five-level model, is adapted to the Internet of Things.

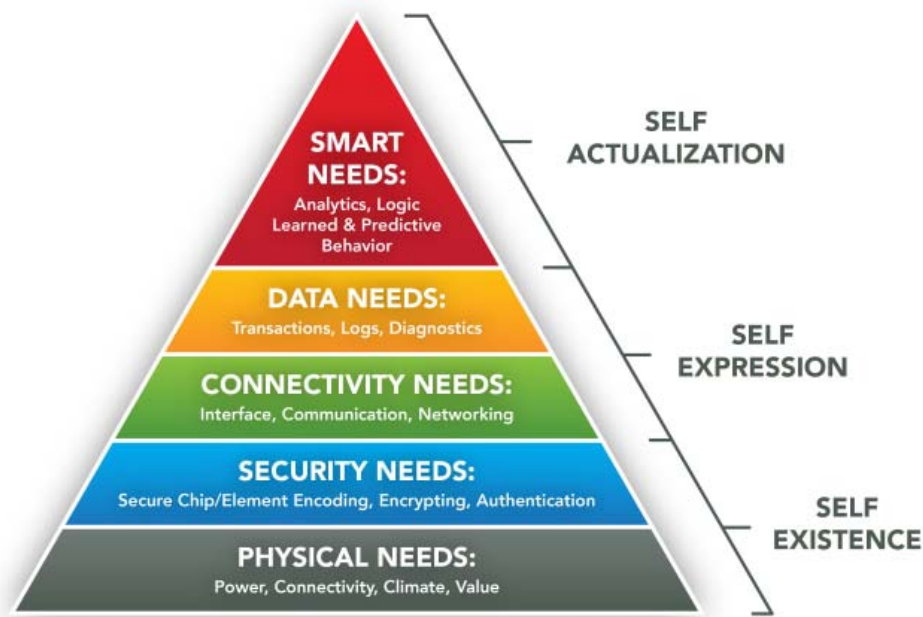


Figure 33: Hierarchy of Need (HON) for IoT. ^[127]

The significant position of “Security” as level 2 is important to acknowledge. In case the beneficiary isn't feeling comfortable sharing data because of a potential privacy risk, this persona is likely to discontinue sharing the data and making use of the services provided as part of the Connected Car Ecosystem. This will be devastating to all business models built upon the Connected Car Ecosystem and considered a cornerstone of the future business models within the automotive industry.

13.5 Features and use-cases

Features in scope of the Thesis, assessing the effect of digitalization as a vital prerequisite to sustain, are based on the definition of the Connected Car; bidirectional communication between the vehicle and the IT-infrastructure enabling services, products, and the communication of vehicle telemetry data. Features not in scope are the following:

- (Semi-)autonomous driving features
- eCall (EU mandate from April 2018 on new vehicles)
- Stolen Vehicle Tracking systems
- Bluetooth technologies enabling hands-free calling
- Vehicle-to-Vehicle communication
- Vehicle-to-Infrastructure communication

The main difference is that the featured, considered part of the Connected Car Ecosystem, envisioned in this Thesis, will need to contribute directly to the value creation (bottom line) of the automotive industry, and in particular the European OEMs.

Features like Vehicle-to-Vehicle communication and Bluetooth hands-free calling systems enable features or services that are beneficial to the user of the vehicle are mandatory in case of Vehicle-to-Vehicle communication, but as such do not enable the OEMs to generate additional revenue by offering services.

13.6 Beneficiaries

The beneficiaries are defined as:

- End-customer (owners and users of vehicles)
- OEMs
- Retailers of the vehicle
- Suppliers to the OEMs (Tier-1)
- Government and Non-governmental bodies
- Apps and Service providers

Based on the scope of the Thesis, the Government and Non-governmental bodies will not be considered. The prime reason being the absence in the value stream contributing to the overall value creating developing, producing, and using a vehicle.

Chapter 14: Connected Services offered by German Premium OEMs (Ytsma)

14.1 Selection of the 3 premium German OEMs

In this chapter, the final leg of the model, will be discussed; the Connected Car related product and service offerings of the 3 selected German OEMs:

- BMW
- Audi
- Mercedes (a Daimler brand)

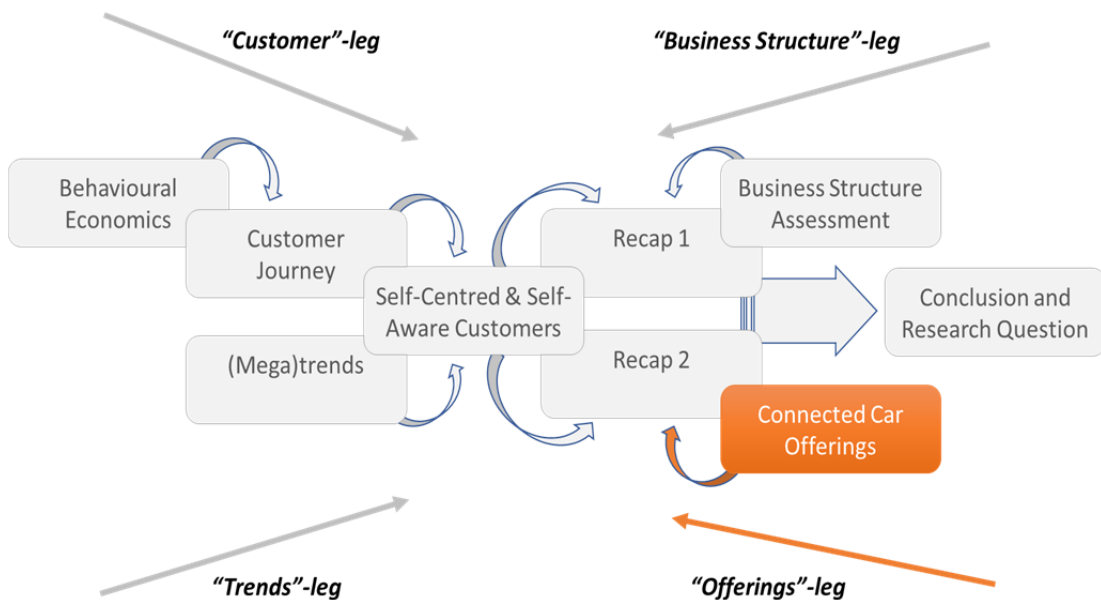


Figure 34: Influence Model – Offering-leg

Traditionally, these German brands lead the way when it comes to innovation - as discussed in chapter 12 - and can be perceived as early adaptors, maturing services and products to high standards. An example is the introduction of the ABS in passenger vehicles; the first vehicle being the Mercedes S-class in 1978. In the following decades, more and more vehicles were equipped with this safety feature and eventually it became mandatory equipment of any passenger car. A similar trend can be seen regarding the offering of Connected Car features.

The graph shows the position of the brands when it comes to “pricing index” and “functionality”. The offerings of BMW and Daimler (Mercedes) are considered:

- value for money (e.g. relative moderate price index)
- mature functionality level

The Connected Car offerings of AUDI are of average functionality and less competitive compared to the BMW and Daimler according to the qualification of SBD.



Figure 35: Competitiveness of OEMs in the Connected Car arena. ^[128]

As part of our research methodology, the subsequent assessments will be conducted in this chapter:

- Describing the current Connected Car offerings of the three, German OEMs
- Categorize the offerings
- Value the (perceived) benefits to the customers

The outcomes of this chapter are a key input for chapter 16. The offerings will be compared with the wishes and needs of the Self-Centered and Self-Aware customer generations “Y” and “Z”.

This will allow us to assess the readiness of the investigated OEM's and guide us towards an idea of who is best positioned to stay relevant for these customer generations, and is best suited to address the needs, and (purchasing) behavior, of these customer segments.

14.2 Offerings of Connected Services in Europe

This section will focus on the current offerings by the selected premium German brands and highlight not only the services, but also the relative relevance to the customer. Defining this relevance to the customer is difficult to assess, since value is perceived differently by different types of customers. Therefore, it is decided to analyze the offerings quantitatively and grade the offerings based on the following attributes:

- **Uniqueness**
Is the feature offered unique for the vehicle or are other products (i.e. smartphone) offering the same feature?
- **Function Relevant**
Is the feature or service relevant to the end-customer with regards to the main purpose of the vehicle; *mobility*?
- **Lifestyle Relevant**
Is the feature or service delivering relevant lifestyle benefits to the end-customer?
- **Cost Benefit**
Is the feature or service providing the customer (in)direct cost benefits?

The features and services will be scored according to the following scheme:

1 = Yes

2 = Indifferent

3 = No

14.2.1 Audi

For the assessment of the connected services offered by Audi, only recent car models are investigated. The offerings on past models isn't too relevant to assess, since technology, and thus correlating services, are expanding rapidly and future services are hard to predict. The information pertaining to the services were collected from Audi company websites.

While assessing the connected features offered by Audi, it is important to mention that the Connected Car features are only available to cars equipped with Audi's MMI navigation system coming as a premium feature. This applies to the following vehicles:

| MODEL* | MODEL YEAR (MY) |
|---------------|------------------------|
| A3 | >MY 2017 |
| A4 | All |
| A5 | >MY 2017 |
| Q2 | All |
| Q5 | All |
| Q7 | All |

*Audi A6, A7 and A8 are not considered since these vehicles will be updated to a new Audi MMI system, which will be introduced with the new A8 in Q3 of 2017.

Table 7: Audi Models included in Connected Car offerings assessment

A vehicle ordered with Audi's MMI system, will receive 3 months of free Connected Services. These services include:

- Data usage provided by the Audi Connect SIM
- Audi Connected Services

In case the end-customer selects the MMI navigation PLUS, the services are offered for a duration of 3 years.

The Connected Services part of Audi Connect are:

| Group | Feature | Unique | Function Relevant | Lifestyle Relevant | Cost Benefit |
|-----------------------------|---|--------|-------------------|--------------------|--------------|
| Navigation related services | Google Earth with Google Streetview Enhancement of the navigation with the known Google Earth User Interface enriched with Streetview. | 3 | 1 | 3 | 3 |
| | Real-time traffic information Traffic information provided in real-time to the vehicle's navigation system in order to provide optional routes in case of congestion. | 3 | 1 | 3 | 3 |
| | Remote Route planning Enables the end-user to create a route before entering the vehicle. The predefined route is sent to the navigation system of the vehicle. When entering the vehicle, the destination and route can be selected by the driver without entering additional information. | 1 | 2 | 3 | 3 |
| | Online map updates The customer can select new maps to support the navigation system online without physically changing hardware (i.e. SD cards) | 1 | 2 | 3 | 3 |
| | Parking information Real-time information on where to park the vehicle in the proximity of the (final) | 1 | 2 | 3 | 3 |

| | | | | | |
|--|--|---|---|---|---|
| | destination. | | | | |
| Communication and Entertainment | Wi-Fi Hotspot Allows the end-user to connect multiple smart devices to the broadband connection of the vehicle. Rather than using the data plan of the phone, the car's data plan is used | 3 | 3 | 2 | 3 |
| | Audi Music Stream Connects directly with the smartphone of the end-user enabling the internet radio streaming | 3 | 3 | 2 | 3 |
| | Online media stream The smartphone connection enables various internet radio channels and music services like Aupeo! and Napster | 3 | 3 | 2 | 3 |
| | E-mail and twitter Enables the driver to listen to email and twitter messages including responding to messages by dictating. | 3 | 3 | 2 | 3 |
| Information | Weather, fuel stations, travel and city A suit of services providing the driver and its passengers information directly and indirectly related to the travelling. The information is supported by the 4G broadband connection. | 3 | 3 | 2 | 3 |
| Emergency Call and Audi | Online break-down assist (b-Call) | 1 | 1 | 3 | 2 |

| | | | | | |
|-----------------|---|---|---|---|---|
| Services | In case of a (technical) issue, Audi's service center can access the information available in the vehicle (failure codes, levels, etc.) to determine the issue and assist the driver | | | | |
| | Audi Service Request The vehicle will automatically inform the designated dealer when it is time for the next service. The dealer will contact the driver pro-actively to schedule an appointment. | 1 | 1 | 3 | 2 |
| | Remote Services The end-user can lock and unlock the vehicle via a smartphone based application as well as activating the additional heating (optional) | 1 | 2 | 1 | 3 |
| | Vehicle status report A smartphone application is providing the customer real-time information regarding the status of the vehicle such as: <ul style="list-style-type: none"> • Lock/unlock status • Fuel level • Parking location • Days/kilometers to inspection | 1 | 2 | 2 | 3 |

Table 8: Overview and scoring of Connected Car offerings - Audi

The next generation of connected services is introduced with the new A8. This will allow Audi to collect more data and provide additional services to end-customers.

The main difference to the current Audi Connect Services is that features are less hardware dependent and more software based. An example is the change of horsepower on request.

14.2.2 BMW

BMW is offering the following Connected Car services to their customers in Europe:

| Group | Feature | Unique | Function Relevant | Lifestyle Relevant | Cost Benefit |
|-----------------------------|---|--------|-------------------|--------------------|--------------|
| Navigation related services | Real Time Traffic Information Real Time Traffic Information provides up-to-date traffic information. The information contains the location of traffic and the duration of the traffic jam. | 3 | 1 | 3 | 3 |
| | My Info/Send to Car This service allows the driver to send, for example, a journey or destination to their car. The car adds this destination automatically to the navigation system | 1 | 2 | 3 | 3 |
| | BMW Routes BMW Routes is an interactive route planner that allows the driver to import BMW recommended prepared driving routes from all over Europe. | 1 | 2 | 1 | 3 |

| | | | | | |
|--|---|---|---|---|---|
| Communication and Entertainment | Online Entertainment BMW drivers can enjoy music from music streaming services. The music services are integrated in BMW's ConnectedDrive system. | 3 | 3 | 2 | 3 |
| | Internet BMW drivers can browse the web, using the iDrive controller and the screen of the infotainment system. This feature comes with an integrated SIM-card for internet connectivity. | 3 | 3 | 2 | 3 |
| Information | BMW Online Consists of a number of applications to provide information to the driver: <ul style="list-style-type: none"> • BMW Online News • BMW Online Weather • BMW Online Applications • BMW Online Office | 3 | 3 | 2 | 3 |
| | BMW Driver profiles It is possible to save the preferences of the driver – such as radio settings, and seat position - to a USB. When the driver switches to another BMW car these settings can be imported. | 1 | 2 | 2 | 3 |
| Emergency Call | Concierge Services | 1 | 1 | 3 | 2 |

| | | | | | |
|--------------------------------|--|---|---|---|---|
| <p>and BMW Services</p> | <p>This service provides BMW drivers with a personal assistant who can be reached by pressing a button in the car. A call center is 24/7 available providing practical information and advice.</p> | | | | |
| | <p>Intelligent Emergency Call In the case of an accident, this system will notify the emergency service automatically. Upon activation of the airbags, the eCall system will automatically contact a public-safety answering point (PSAP) or a trained operator at a BMW call center.</p> | 1 | 1 | 3 | 3 |
| | <p>Remote Services This service connects the driver's smartphone with his car so that the driver can check information regarding his car on his phone. Besides vehicle health information, it will also be possible to lock or unlock the car.</p> | 1 | 2 | 1 | 3 |
| | <p>Teleservices Teleservices provides seamless communication with a BMW Service Centre. Vehicle health</p> | 1 | 1 | 3 | 2 |

| | | | | | |
|--|---|--|--|--|--|
| | <p>information is transmitted to the designated service center. When a service is needed, the system will inform the driver and send the car's data to the BMW Service Partner.</p> | | | | |
|--|---|--|--|--|--|

Table 9: Overview and scoring of Connected Car offerings - BMW

14.2.2.1 BMW Ecosystem Architecture

The diagram below provides an overview of BMW's partners that support BMW delivering the Connected Car ecosystem.

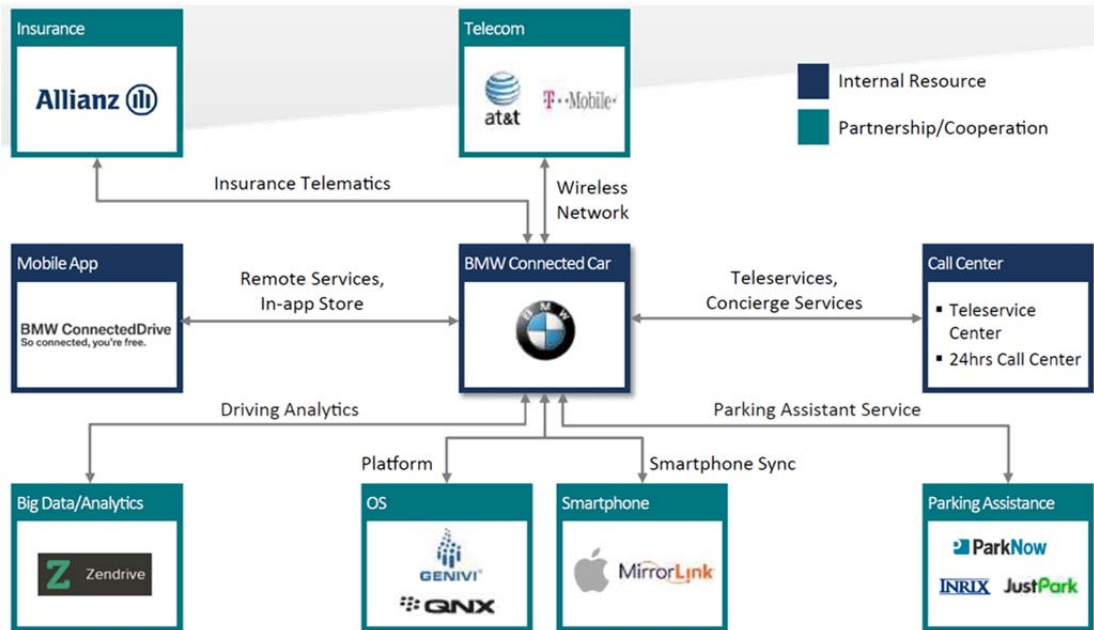


Figure 36: BMW's Connected Car ecosystem. ^[129]

In May 2017, BMW launched the next generation of Connected Services, based upon the existing ecosystem, leveraging the strength of its partners. This new platform is introduced as “BMW CarData” and is enabling customized service options for BMW drivers based on data from the vehicle. BMW customers will be able to allow third-parties to access their data and provide relevant services. The customer is in control of what data will be shared, and as such compliant with the new European regulation regarding data privacy coming into effect in 2018 (General Data Protection Regulation). BMW describes in a press statement how CarData works: *“The vehicle generates data, including condition data, like mileage; usage-based data, such as average fuel consumption; and event data, like an automated service call. Some of this data is transmitted exclusively, in encrypted form, as so-called telematics data via the permanently installed SIM card to secure BMW servers. From there, with the consent of the customer, service providers can access the encrypted data needed for certain services”*. ^[130]

BMW CarData will be rolled-out in Europe, starting in Germany by mid-2017. During the process of writing this Master's Thesis, only limited information regarding BMW's CarData services was available. However, it seems that BMW opts for a transparent way of accessing privacy sensitive data and provides services and offerings in return. It is the customer's choice to opt out. Whether customers notice the benefits

of the services offered, and in return share data with BMW, will need to be examined in the years to come.

14.2.3 Daimler (Mercedes)

Daimlers is offering the following Connected Car services as “Mercedes Me’ to customers in Europe.

| Group | Feature | Unique | Function Relevant | Lifestyle Relevant | Cost Benefit |
|--|---|--------|-------------------|--------------------|--------------|
| Navigation related services | Live traffic information Provides the ideal route to a defined destination, based on available traffic information. | 3 | 1 | 3 | 3 |
| | Car-to-X-Communication Mercedes considers this part of the Connected Car and therefore it is mentioned in this paragraph. However, according to our definition of the connected car, radio, and sensor technology used to warn the driver about potential upcoming accidents, and other hazards, isn't part of the scope of this Thesis | N/A | N/A | N/A | N/A |
| Communication and Entertainment | Wi-Fi Hotspot Part of the optional COMMAND Online system. | 3 | 3 | 2 | 3 |

| Information | N/A | N/A | N/A | N/A | N/A |
|---|--|-----|-----|-----|-----|
| Emergency Call and Mercedes Services | Concierge Service This service acts as a personal assistant, answering questions, booking concert tickets, recommending restaurants, etc. Input parameters are the location of the natural person (and the smartphone) and the location of the vehicle. | 1 | 1 | 3 | 2 |
| | Standard services These services include the following features among others: <ul style="list-style-type: none"> • Remote vehicle diagnostics • Breakdown alert • Accidents alert Relevant vehicle data are transmitted as required and further measures are initiated as necessary. The available services include Maintenance Management, Breakdown Management, Accident Recovery and Mercedes-Benz emergency call. | 1 | 1 | 3 | 2 |
| | Remote Online Information regarding the vehicle is presented | 1 | 2 | 1 | 3 |

| | | | | | |
|----------------|---|---|---|---|---|
| | <p>to the customer via the Mercedes Me app on the smartphone:</p> <ul style="list-style-type: none"> • Parked Vehicle locator • Vehicle Tracker • Geofencing • Remote lock/unlock • Pre-conditioning of vehicle • POI send to vehicle <p>Vehicle Health Status (e.g. tank fill level, tire pressure or the state of the brakes)</p> | | | | |
| Comfort | <p>Remote Park Pilot</p> <p>The Remote Parking Assist recognizes parking spaces as the car drives past them and is able to park the vehicle almost automatically with the owner controlling the parking maneuvers via the app on the smartphone</p> | 1 | 1 | 2 | 3 |

Table 10: Overview and scoring of Connected Car offerings – Mercedes (Daimler)

14.3 Scoring of the Connected Car features

Based on the qualitative scoring of the Connected Car features, the relative relevance of the Connected Car features is determined for the following attributes:

- Uniqueness

- Function Relevant
- Lifestyle Relevant
- Cost Benefit

Unique

| Category / Group | Average AUDI | Average BMW | Average Mercedes |
|---------------------------------|--------------|-------------|------------------|
| Navigation related services | 1.8 | 1.67 | 3 |
| Communication and Entertainment | 3 | 3 | 3 |
| Information | 3 | 2 | N/A |
| Emergency Call and Services | 1 | 1 | 1 |
| Comfort | N/A | N/A | 1 |

Function Relevant

| Category / Group | Average AUDI | Average BMW | Average Mercedes |
|---------------------------------|--------------|-------------|------------------|
| Navigation related services | 1.6 | 1.67 | 1 |
| Communication and Entertainment | 3 | 3 | 3 |
| Information | 3 | 2.5 | 1.33 |
| Emergency Call and Services | 1.5 | 1.25 | 1 |
| Comfort | N/A | N/A | 1 |

Lifestyle Relevant

| Category / Group | Average AUDI | Average BMW | Average Mercedes |
|---------------------------------|--------------|-------------|------------------|
| Navigation related services | 3 | 2.3 | 3 |
| Communication and Entertainment | 2 | 2 | 2 |
| Information | 2 | 2 | N/A |
| Emergency Call and Services | 2.25 | 2.5 | 2.33 |
| Comfort | N/A | N/A | 2 |

Cost Benefit

| Category / Group | Average AUDI | Average BMW | Average Mercedes |
|---------------------------------|--------------|-------------|------------------|
| Navigation related services | 3 | 3 | 3 |
| Communication and Entertainment | 3 | 3 | 3 |
| Information | 3 | 3 | N/A |
| Emergency Call and | 2.5 | 2.5 | 2.33 |

| | | | |
|-----------------|-----|-----|---|
| Services | | | |
| Comfort | N/A | N/A | 3 |

Table 11: Summary scoring of Connected Car features – Audi, BMW and Mercedes (Daimler)

Based on the analysis, the conclusion is:

- The offerings of Mercedes are less unique when compared to the offerings of BMW and Audi. This is in-line with the findings of SBD (see paragraph 14.1 - Selection of the 3 premium German OEMs)
- The offerings of the OEMs in the category “Emergency Call and Services” is both unique and relevant for the function of the vehicle. These features are close to the domain of the OEM.
- None of the OEMs are offering lifestyle relevant features, although the Connected Car functions are marketed as lifestyle relevant, showing an immanent perception gap between OEMs and their customers of what is relevant for the end user.

According to a large, global survey conducted by Accenture in 2013, the following technologies as features are important to end-customers. The percentage indicates the percentage of people who answered a question on whether they would use the features with, “Would like to use”:

- High Quality Navigation 73%
- eCall 81%
- Car space detection 78%
- Identification of congestions 75%

According to this survey, the Connected Car features, offered by the OEMs are meeting the needs of the customer in 2013. In Chapter 16, the relevance of these features for new customer generations will be evaluated. This will ultimately showcase which OEM is capable of offering relevant features and products to the Self-Aware and Self-Centered Customer.

Chapter 15: Relation between Customer Decision Journey and the industry assessment according to Porters' 5 Forces (Schmidt & Ytsma)

After assessing the 4 legs of our model applied throughout the Master's Thesis, we will now combine the conclusions of the first two legs as part of the activities referred to as "Recap 1". This enables us to understand the relation between the customer decision journey and the industry structure determined in Chapter 11 – Assessment of the automotive industry.

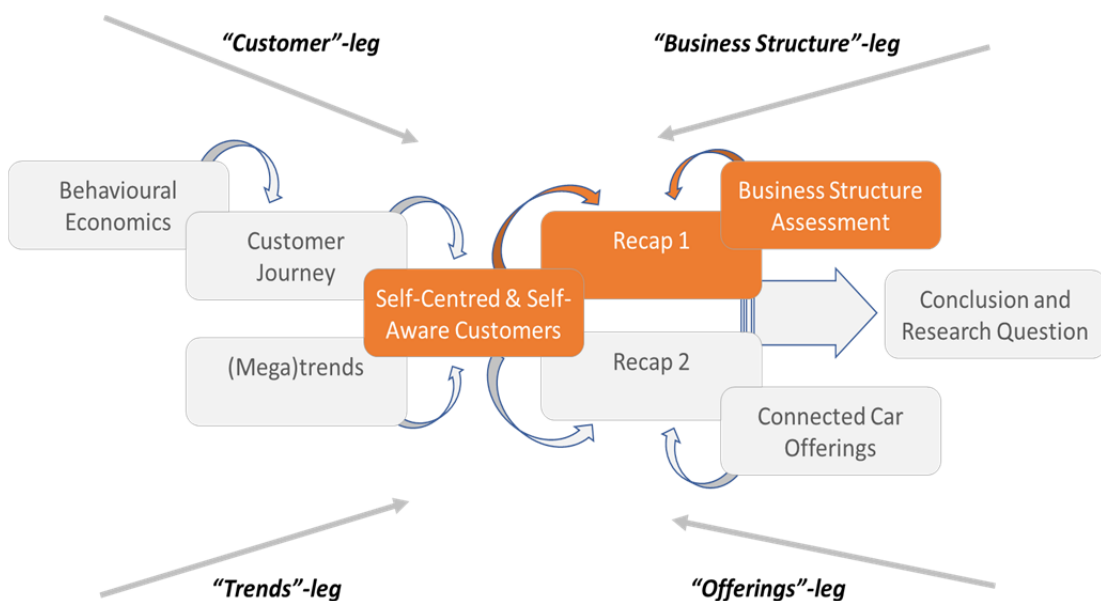


Figure 37: Influence Model – Recap 1

We have seen that the demand side of the automotive industry, assessed by Porters 5 Forces, is strong. The strongest force is the "Power of the Buyer" and in particular the sub-forces: switching cost, quality expectation of the product offered and price sensitivity. Numerous surveys are confirming that these forces are indeed strong regardless the generations of buyers. Although there are differences between the various customer generations, and it is important to acknowledge them to be able to predict the potential changes in strength of the demand-side forces. These changes may eventually reduce the potential profitability of the industry (even further) and ultimately change the entire business structure.

It is apparent that Millennials and the Gen Z customers have a different view on products and services. The products in favor of these customer groups should be practical, and meet the individual needs of the Self-Centered and Self-Aware customer. Brand perception and sole image driven evaluation and selection of products are declining decision-making factors. Continuous optimization of the product itself and relevant offerings that enhance the practical use of the product are deemed necessary.

We conclude that this journey model is not only relevant for new generations of customers that are part of the Self-Aware and Self-Centered age (Gen Y and Gen Z), but also for previous generations. These customer generations, currently entering the market for purchasing vehicles, have different trigger points to be met when deciding for a brand, and they are more mature in terms of gathering information with their expectation towards brands to fulfil their needs. In more general terms, we conclude the following with regards to the purchasing behavior of the customers and their needs:

- Consumers have more power than they used to have. The digital world itself and the transparency that comes with the digital age are key drivers of this power. The ability to shop around, change brands and demand greater value from companies suited to one's needs is greater than it used to be. In parallel an endless amount of information is available for the consumer helping him to an unparalleled amount of choices in his decision-making process. The aim of these savvy customers is to make the best possible decision and reassure them, even after the purchase of this decision.
- The significantly reduced half-life of technology puts more pressure on companies to change, evolve and defend themselves against substitutes and new entrants. At the same time customers have ever increasing expectations of products to be relevant exactly to their needs. This is partially due to the proliferation of technology impacting all facets of their daily lives. Companies that move too slow let competitors and especially new disruptive market entrants take the lead and risk losing once-loyal customers in the process.

With already strong (sub-)forces on the demand-side, according to Porter's 5 Forces and with the purchase behavior change of the various customer generations - in particular the Millennials and Gen Z - it is expected that the strength of the demand-side (sub-)forces will increase. To predict the future, the approach is to consider the past; identifying whether Gen Z and the Millennials had a disruptive influence on other industry structures already, and apply this knowledge to the automotive industry.

The industry that was changed by the shifting customer purchasing behavior, driven predominantly by the Self-Aware and Self-Centered (GenY and Z) generations and assessed in detail, is the mobile phone industry. When comparing the structural changes of the (smart)phone industry, we conclude the following:

- The traditional players in the mobile phone industry were focusing on the technology of the (mobile)phone, the hardware itself, but not necessarily on the relevance of the product to the customer. The Millennials, raised in an age where internet became the predominant source of information and unparalleled access to information, data and content became normal, started to look for products more suited to their expectations. A telephone for the sole purpose of telephoning was not deemed hip and interesting enough anymore. However, many traditional (mobile)phone players continued to focus on hardware excellence and believed that this would keep being the key to success for defending themselves against potential new entrants; hence they relied on a relatively weak buyer's force.
- However, the opposite was true. New entrants had the opportunity to enter the market by understanding the new, changed demands of the customer: Mobile access to information and content combined with enhanced features and usability enabled by capacitive touch screens, affordable and broadly available broadband internet access and an operating system enriched by a platform for apps (e.g. iOS and iTunes). These ingredients ultimately delivered what we know today as the smart phone.

- Rather, the customer turned out to be practical and, to a large extent, brand agnostic to established brands as these traditional brands were not able to create a certain lock-in that would discourage the customer to move away from their brand.
- A study by Timo O. Vuori & Quy N. Huy provides us the evidence that Nokia's middle management was relying on the capabilities of the engineers to develop solutions and innovation that would convince customers to buy a Nokia. Build quality and hardware specification were key. The OVI-store (Nokia's genuine app store) was developed allowing customers to download apps, but the content was hardly relevant and never reached the critical mass to be relevant for new entrants to develop apps for it (in comparison to Google's and apple's app stores).
- The same study shows that Nokia's top management knew about Apple's iPhone 1.5 years before it was introduced and they feared the capabilities of this new smartphone. However, the management team failed to address and structure this threat within their organization, allowing middle management to respond adequately.
- Multiple studies show different reasons why Nokia couldn't stay at the peak of mobile phone production, but it is clear that the internal miscommunication, and the focus on hardware rather than pursuing and catering to practical demands from customers, were the grounds for the decline of Nokia's hegemony. Neglecting these forces finally resulted in a swift evolution of the business structure.
- This shift of business structure within the smart phone industry resulted in a new level playing field of Porter's 5 Forces. The current technology level is protecting the smartphone industry against new entrants; until the time a new technology emerges, enabling other companies to enter the market, similar to what happened in the mid-2000s.
- The biggest alteration of strength of Porter's 5 Forces can be found on the buyer side. This force was strong, but had significantly weakened by the "lock-in" of end-customers.

Smartphones and their platforms, especially iOS, became an integral part of people's digital life encompassing multiple hardware platforms. At the same time, the force of substitutes has weakened for the same reasons; the smartphone is the hardware that provides a variety of features ranging from access to social media, information, and content, (e.g. Spotify and Netflix) and combines the features of single-purpose products such as, a Personal Navigation Device (PND), a music player, a video player, and a compact camera.

Considering the major change in the mobile phone industry from a product point of view that lead to the smartphone we know today, we conclude that the change was fueled by:

1. *Emerging technologies* - the capacitive touch screen and the unlimited access to internet (and thus content and information) through 3G and 4G at a later stage.
2. *The inability of mid- and higher-management* – responding inadequately to threats from potential new entrants, combined with a certain over self-confidence that resulted in focusing on the perceived company strengths rather than focusing on the upcoming and rapidly changing needs of the new customer.
3. *Ignoring changing customer demands* - not only that the established customer generations changed their mobile phone utilization behavior (from mobile to smart), but more specifically the negligence of the needs of the highly relevant Self-Centered and Self-Aware customer that had entered the market and had different needs and expectations than previous generations made the leading traditional mobile phone player Nokia ultimately fail.

Comparing the automotive industry with the (smart)phone industry from the mid-2000s, we consider the following parallel and dissimilarities.

15.1 Parallel between the automotive industry with (smart)phone industry.

- According to the assessment of both the automotive industry and the mobile phone industry in the mid-2000s the strongest (sub-)forces are on the demand side. The power of the buyer is considerable, and expected to increase in case of the automotive industry.
- Self-Aware and Self-Centered customers have a new view on brands and a stronger focus on the (intrinsic) value of a product.
- If brands can't meet the speed, price and quality expectations of new generations, they're automatically irrelevant. However, considering a playing field where other factors are at parity, Millennials and Gen Z will, time and time again, choose these brands that support their efforts to be unique, and help them to cultivate their personal, constantly evolving identity. Brands seeking to win their trust must create products that are on-trend, make a statement, showcase innovation, and/or help make the world a better place – not to mention make their lives simpler. Additionally, if brands can create entertaining and informative content that supplement these products, they are in an even stronger position to earn Gen Z loyalty.
- The automotive industry is focusing on quality, production and design of hardware. Quality is an important purchasing decision, if you own a car. However, in the growing field of New Mobility Solutions (NMS) where car-sharing and short-term lease prevail, the quality of the vehicle will become less relevant to the end customer. The parallel with Nokia is strong. Nokia, focused on quality and that message was given across all management levels. We see a strong parallel with Volkswagen's endeavor to improve quality and reach the mark of ten million produced cars per year. The question is to what degree the customer was, or is, benefitting from that striving.
- The possible threat of new entrants is observed and retaliation is not the prime reaction. Nokia knew about Apple's iPhone, but reacted in a traditional way; focusing on the company's strong points rather than

assessing whether the needs of the customer were addressed by this inward focus. There seems to be a parallel with the automotive industry considering its response to Tesla's ground-breaking approach when it comes to the powertrain, the customer-centric services, features now added to the sheer mobility delivery and an up-rise of potential new entrants like Google and Apple.

15.2 Dissimilarities between the automotive industry with (smart)phone industry

- The (smart)phone industry was less mature during the mid-2000s compared to the 130-history of the automotive industry. This results in a market with very moderate growth potential and limited margins. This isn't attractive for potential new entrants considering the high investments required. The success of new entrants entering the automotive market is small. Although, we should consider that this not entirely true for growing markets like China and India. The same applies to new entrant companies that are willing to invest in a mature OEM, pursue its development path and by this circumnavigating to go the cumbersome path of developing the skills to build a car from scratch.
- The initial and total cost of ownership of a (smart)phone and a vehicle are not comparable. This is resulting in a different level of price sensitivity and a longer, more reflected buying behavior.
- Car brand heritage plays a significant role in the purchasing decision and brand loyalty which hasn't been the case with mobile phones. Again, it is yet to be seen if today the so important brand perception is keeping its value, thus influencing the purchasing decision of an end customer; especially when it comes to NMS' and the new customer Generations Y and Z.
- The threat of substitutes was strong in the mid-2000s and remains strong in the automotive industry. However, since the smartphone is playing an important role in the lives of consumers, the threat of substitutes has changed to weak.

If the strengths of the forces, which play a role in the automotive industry, are compared with the forces applicable to the mobile phone industry from the mid-2000s until the mid-2010s, and if we overlay these results with the decision journey aspects and the perceived value of a product in the eyes of customers, we conclude the power of the buyer will become even stronger.

The traditional strongpoint of the automotive industry; production excellence, design and brand image are likely to be of reduced importance for these new customer generations. The parallels with the mobile phone industry, when it comes to understanding the needs of the new customer generations are apparent. The power of the buyers will result in an automotive industry ecosystem opening for new, potential market entrants, which we expect to significantly stir up the distribution of market share, profitability and turnover. New players will emerge and push out those established ones incapable of adapting to the new age of automotive customers and product expectations.

Although the force of entrants is considered low for the automotive industry, due to - among others - high capitalization and a unique skill set required to produce vehicles for a mass market, this is only applicable in case the technology required to deliver the product or service (e.g. mobility) is considered largely unchanged. In other words, if the focus of the product is still the vehicle itself providing mobility only. New entrants will have difficulties in entering the automotive market if they aim to sell vehicles. However, entering the mobility market with substitute products that appeal to the needs of new consumer generations, based on new technologies like the Connected Car and the offerings surrounding this novel technology, new entrants will have a chance to succeed as Millennials and Gen Z customers, especially, seem to be willing to give new entrants a chance. We believe that a similar trend in the automotive industry is visible, in comparison to how these two customer generations impacted the mobile phone industry in the mid-2000s. Our conclusion with regards to the relation between the industry structure change and the customer journey, explicitly stated in the previous paragraph, is largely based upon the strong parallels between the current structure of the automotive industry and the structure of the mobile phone industry in the mid-2000s. The same new customer generations that fueled the change in the mobile phone industry is now entering the market of the automobiles. These new customers generations

want products which are relevant; meeting their needs or their aspirated lifestyle. They expect the manufacturer (OEM) to be loyal to them and create multiple touchpoints as part of the customer journey. However, with a changing and increased versatility demand of mobility, this is a difficult task for OEMs.

Chapter 16: Relation between the consumer journey and the offerings from the automotive industry (Schmidt & Ytsma)

16.1 Introduction

In this chapter, we will use the “Connected Car” classification provided by Gartner, the conclusions from Chapter 8 – Disruptive Behavior of the Millennials and Generation Z, and Chapter 14 – Connected Services offered by German Premium OEMs to:

- evaluate to what extent these offerings can be considered “Connected Car” technology
- understand the relevance of these offerings for the new customer generations

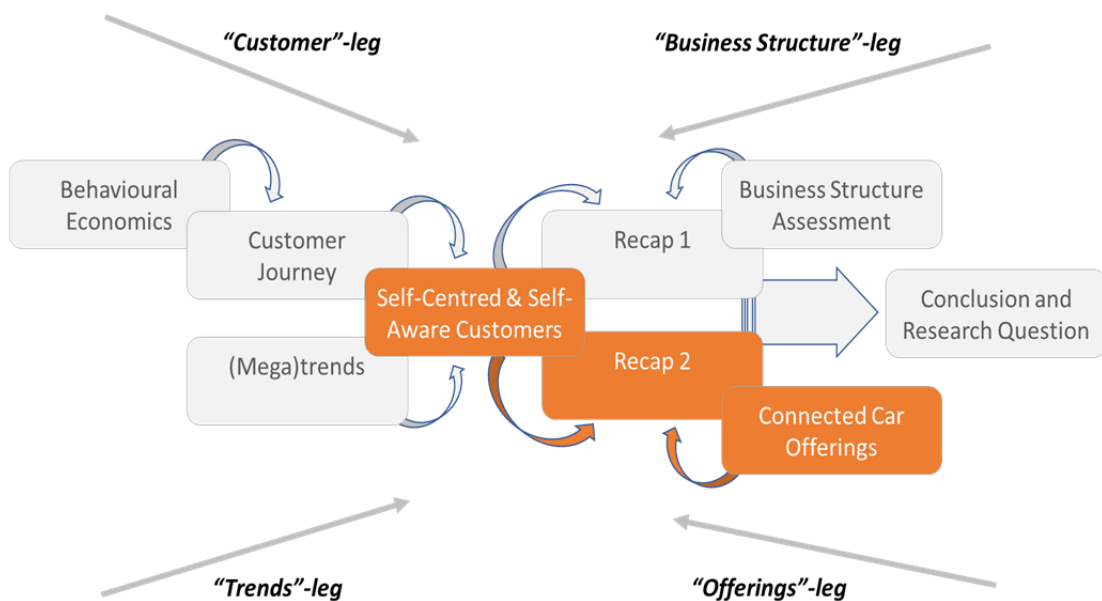


Figure 38: Influence Model – Recap 2

16.2 Connected car offerings

The Connected Car related offerings of the 3 German premium OEMs assessed in this thesis is characterized by the following attributes:

- Navigation and related services
- Communication and Entertainment
- Information
- Emergency Call and (related) Services
- Comfort

Based on the qualitative scoring of the features and offerings in Chapter 14, it became apparent that none of the Connected Car offerings are lifestyle relevant, but more focused on the prime function of the vehicle; mobility and driving. It can even be argued whether the features listed are genuine “Connected Car” features according to the definition of a Connected Car ecosystem set forth in Chapter 13 – Defining the Connected Car Ecosystem.

Features related to “navigation” are predominantly unidirectional and so are the features characterized by the attributes, “Communication and Entertainment”, and “Information”. Most of the Connected Car features, listed within the above-mentioned categories, provide a window or entry point to the customer while being in the vehicle; providing information or content that is requested by the customer on need-basis. This is a strictly unidirectional stream of data and information.

Only the features listed as part of “emergency call and services” are based on a bidirectional communication between the vehicle and an IT back-end. Information from the vehicle and the driver is used and enriched to provide the customer focused services that are time or situation relevant. However, the features are directly or indirectly related to the main purpose of the vehicle; mobility.

The fact that these features are relevant to the core purpose of the vehicle attracts the new customer generations, in particular Gen Z. However, the features characterized by the attributes “emergency call and services”, as well as the other features that are part of the Connected Car offerings of the German OEMs, are not meeting the demands of the Self-Aware and Self-Centered generations when it comes to:

- Increasing the ownership experience.
- Reconfirming that the right purchasing decision was made by continuously engaging with the customer as part of the customer journey. Providing the comfort that the gain exceeds potential losses.
- Triggering emotional response to the product
- Appeal to the customer's social image by being technologically up-to-date.
- Engaging with the customer's connected lifestyle.

Based on our findings in Chapter 8 and 15, we conclude that the above-mentioned (indirect) product characteristics should be integrated into products offered by the OEMs. It has been concluded in Chapter 15 – *Relation between Customer Decision Journey and the industry assessment according to Porter's 5 Forces*, that the automotive industry will face challenges defending itself against the increased force of the buyer; the demand-side. Neglecting these characteristics will increase the strengths of the following sub-forces:

- Search of substitutes (for mobility)
- Encouraging of new entrants

Although we haven't found enough evidence during the research activities that lead to this Thesis, we see strong indications that the automotive industry will need to go through a business structure change to sustain. We base our assessment on the fact that the (smart)phone industry went through a similar industry structure change between the mid-2000s and mid-2010s. The key differentiators between the companies that entered (e.g. Apple) and survived (e.g. Samsung), and the companies that heavily suffered from the business structure change - nearly becoming irrelevant (e.g. Nokia and BlackBerry (RIM)) - were:

- the operating system that enabled a suite of service, not directly related to the prime purpose of a phone; making phone calls
- the delivery of relevant and practical content
- becoming a (seeming) essential part of the end-customer's life as a result, entangled in many day-to-day activities supporting their seamless connectivity.

Although there are similarities and dissimilarities between the (smart)phone industry and the automotive industry, the world-wide trends and the purchasing behavioral change of the Self-Aware and Self-Centered generations shouldn't be neglected. The previously mentioned differentiators in the (smart)phone industry are not stand-alone keys to success (or survival), but mere developments that lead to products and services that were meeting the changing customer's demands uncompromisingly.

It isn't about the hardware, but about the applications developed for it that began to play an important role in the customer's life. Mobility hence will need to become more tailored, practical and individual thus responding to the needs of a customer.

As a result of our research we identified a major gap: The Connected Car offerings of the German premium OEMs (and many other OEMS) are not addressing the needs of these new customer generations. This may ultimately lead to new entrants developing relevant substitutes that deliver the core functionality of the vehicle (mobility), while providing a platform that delivers a truly seamless connected experience. In the latter case, the vehicle will become the hardware that carries an ecosystem delivering the needs of the connected customer, ensuring the touch point prior to driving/buying a vehicle and while using the vehicle. This platform, or ecosystem, will be key in understanding the needs of the customer, generating revenue and unlocking new market potential.

Also in this potential future scenario, the parallel with the smartphone industry is strong; content and application, delivered by the app-stores and operating systems (iOS, Android) satisfied the needs of the customer. Hardware is a given and not the decision-making factor once brand-image (related to hardware and design) was diluted. However, the hardware suppliers prevailing in the strong consolidation phase of the market will still be able to harvest good profits, as seen in the smartphone industry with the likes of Apple and Samsung. The brand-equity creating factors have moved from hardware to connected content delivery and the availability of apps that enhance the connected life of customers.

Chapter 17: Conclusion (Schmidt & Ytsma)

Summarizing and challenging all previous research, we have now reached a point in which we like to draw our conclusions and challenge our hypothesis against the researched status quo of the 3 leading German automotive OEMs.

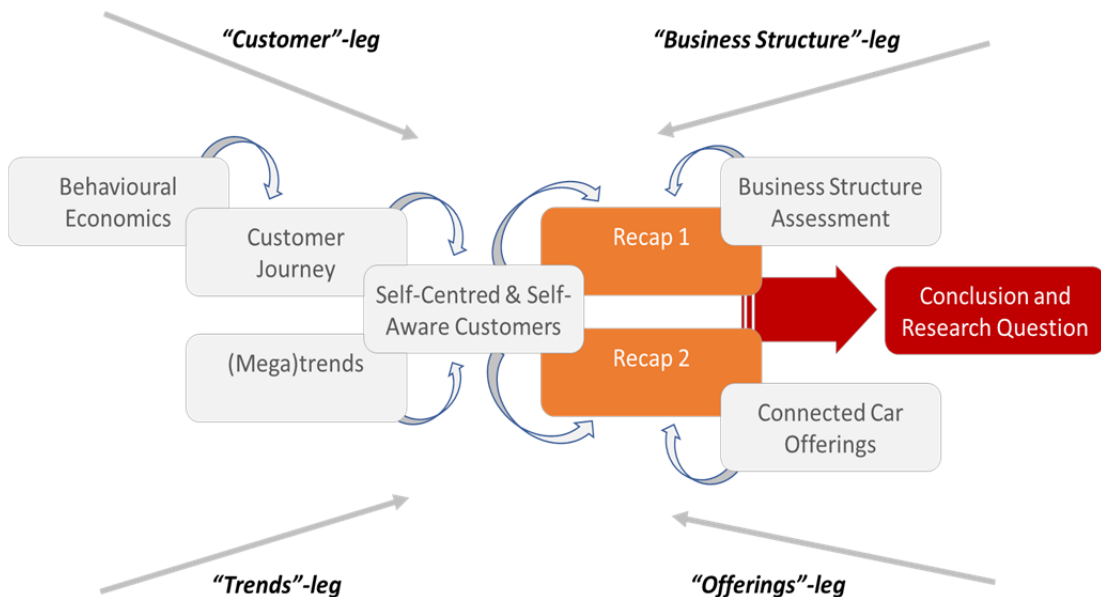


Figure 39: Influence Model – Conclusion

17.1 Hypothesis and Research Questions

This Master's Thesis studies whether digitalization and connected technologies are vital prerequisites to be understood and embraced in full by automotive OEMs in order to sustain as a brand, or even as an entire industry. To study this, and find supporting evidence to confirm this hypothesis, we created a model allowing us to combine the behavior of the customer, the (mega)trends within society, the business structure of the automotive industry, as well as the (smart)phone industry and the offerings of the 3 German premium OEMs. The inputs for this model were based on available datasets provided by global acting research institutes, qualitative analysis, and scientific research papers.

We find that connected technologies and the digitalization of the automotive industry are key elements for the automotive industry to remain profitable. The new customer generations, identified as Self-Aware and Self-Centered, are profoundly keen to select a brand and products which are relevant, and integrated into their digital life. These new decision-making purchasing behaviors are fueled by (mega)trends and not only reflected by the new customer generations, but, to a lesser extent, also by Generation X and Baby-boomers. The current Connected Car offerings of the 3 German premium OEMs are not meeting these requirements set forth based on the qualitative analysis.

1. *Content and features will be key in continuing to evolve after the start of production and while the vehicle is in use.*

The Self-Aware and Self-Centered generation is expecting the OEMs to engage with them, rather than the other way around. These customers expect continuous engagement to confirm their purchasing decision.

2. *The expectation of the customer will need to be satisfied or exceeded to sustain as a business.*

This is considered true, although the expectations of the customers are likely to change during the customer journey. It is key to understand these changes to stay relevant. OEMs can't rely on brand-equity build in the past years.

3. *The model itself will shift from being solely hardware focused to mobility as a service to a content provider.*

We have found insufficient evidence to confirm this and more research will need to be carried out in this field. However, there is a strong parallel with the (smart)phone industry, indicating that hardware will become less relevant and platforms and services delivered to the customer will be increasingly important. Although, it is key to note that Apple especially is focusing on hardware. Our suggestion is that more research in understanding the purchasing-decision factors of Apple products will need to be investigated.

4. *The critical triangle is formed by; End-customer, Society and Automotive Industry.*

We found sufficient evidence that a critical triangle is formed by the needs and purchasing behavior of customers and the (mega)trends currently observed in the world. Trends with regards to individualism, urbanization, and environmental awareness have, and will have, an even greater influence on the automotive industry. According to the industry structure assessment by Porter's 5 Forces, the demand side is strong and the characterization of the Self-Aware and Self-Centered customers will only increase the "power of the buyer". In case the demand of this buyer is changing, influenced by the (mega)trends and vice versa, the industry will need to react in order to stay relevant and protect itself against substitutes and potential new entrants, offerings New Mobility Services.

We also found that the model we have created, enabling us to answer the research questions, is a solid base to assess to what extent trends, and change of customer behavior influence, and potentially alter, existing business structures within an industry. The 5 Forces, defined by Porter and enriched with two sub-forces on the demand-side allowed for comparison of the business structure of the automotive industry, with the mobile phone industry. This was vital to predict the future, and provide recommendations for the automotive industry and, in particular, the premium German OEMs.

We find that the model working effectively, since we were able to explain in hindsight the business structure change in the mobile phone industry. However, we believe that refinements and simplifications of the model are necessary to ultimately quantify the profitability change of an industry as a result of customer behavior changes and (mega)trends.

17.2 Discussion

The challenge is to incorporate all potential, influencing factors that determine the profitability of an industry. It is even more thought provoking to predict the profitability of a highly mature industry that has slowly evolved over-time, rather than reinvent itself in a revolutionized fashion.

It can be challenged that we haven't looked in tools like PESTLE to assess the macro-environmental factors influencing the industry. Instead, we chose to focus clearly on the end-customer, the trends affecting the customer purchasing behavior, and the business structure; directly linked to its profitability. Although, the supplier-side and the rivalry amongst the competitors hadn't been neglected, the focus of this Thesis was on the demand-side.

This resulted in a simplified characterization and potential simplification of the European automotive market. Although we are confident that our model, created and used throughout this study, has provided the scientific evidence allowing us to explain the business structure change in the mobile phone industry and predict the future of the automotive industry regarding connected services, we believe that enriching the model with elements from the PESTLE tool will be relevant in the further evolution of our model.

Furthermore, we suggest expanding on the decision-making purchasing behavior of the new customer generations that have already entered other industries outside of the mobile phone industry. This will provide improved insights of the behavior of these customers other than the descriptive scientific papers used for Chapter 6 and 8. We suggest looking into the retail industry and potentially the influence of digitalization in the housing market.

It can be argued whether the model is mature enough to answer the research question of this Master's Thesis, but we are confident that it is a firm first step in understanding the implication of complex customer purchasing behavior trends and the relative influence of these trends for industries.

We have committed ourselves to continue working on the model, refining and simplifying it where possible. We will continue to challenge our hypothesis and start the assessment of other industries in a similar fashion to mature the model going forward.

Chapter 18: Recommendation (Schmidt & Ytsma)

With special focus on the 3 German OEMs dealt with in this Thesis, but applicable as an overall catalogue of recommendations, we see a rapidly growing need for adaptation and change for automotive OEMs in business model, product, service delivery, and touch point creation with the customer. In the previous chapters we learnt about:

- The changed customer purchase behavior
- The rising relevance of connected features catering to the real needs of consumers
- Mega trends influencing the industry
- The Self-Aware and Self-Centered customer generations on the rise
- The rapidly growing force of the buyer

Taking the above-mentioned learnings into consideration, we expect that the competition of traditional and mature automotive companies with new incumbent players, including new entrants, start-ups, and legal firms entering the market in a rapid pace will encourage the introduction of proprietary, and quantitative market models in economically attractive segments. Those companies (incumbent and new entrants) willing to harvest the biggest part of this growth potential in the automotive industry, will need to make serious considerations in order to show adaptability towards the tremendous transitions in the market. Obviously, the scope of this Thesis is allowing for only a limited insight into the researched OEMs' awareness of these trends and their adaptability to the changing market in general. However, with the information on hand we believe the following building blocks of initiatives can play a vital part in pro-actively tackling and ultimately changing their business approaches and customer understanding, guaranteeing them to sustain as a profitable growth business.

In general, active participation in dominant and disruptive market trends will be required to become aware of economic and consumer viability at a sufficiently early point in time. Changes in demographics especially will make it difficult to predict exact market potentials. Hence, sophisticated planning and agility will be needed to scale up new and comparatively attractive business models to tackle the uncertainties in the market.

18.1 Adapting the organization to change

In the near future, there will be transformative trends including diverse-mobility, autonomous driving, electrification of cars and high amounts of connectivity in the entire industry of the automotive sector. This will call for not only production and sales process changes but heavily impact the overall structure and set-up of the established OEMs' company/corporate structure in order to guarantee for the needed agility in the market place. Therefore, we recommend the following:

1. Create more agile organizations

Smaller, more agile business units imbedded in a matrix comprising geographical markets and technologies. Connected services and customer segments able to address demographic and geographically diverse markets segments in a more responsive, more rapid and effective way, must be created. These sub units will need to serve as incubators for innovative business models the new customer generations will expect from attractive automotive players.

2. Advance and speed-up R&D

The R&D sectors will, accordingly, need to adapt to catch up the pace and enable product upgrades and enhanced lifecycle necessary for the business development. In collaboration with leading research institutes incubation think tanks will have to be established to complement, and accelerate the development of customer relevant technology.

3. Collaboration, M&A and Spin-Offs

Trending and promising technology and service companies will have to be scouted, partnered with, and integrated at an affordable stage going forward. Adding to the in-house portfolio of skills these integrations will guarantee for faster adaptations to market changes and customer needs. New growth areas can thus be independently developed and potentially spun off once market ready, enlarging the OEM's traditional business fields.

18.2 Identifying and building new talent

This change of business conduct will also call for different skill sets in all parts of the automotive industry, incubating new roles and responsibilities, adapted and totally new job profiles. Therefore, it is of paramount importance to:

1. Find the right talent

The talent and human capital living up to this change needs to be identified, developed and kept. Learning from highly agile companies, the likes of Google (Alphabet Inc.), and accordingly adapting work environments, job profiles and incentive models, to name a few, will be necessary to attract these sought for talents in the market.

2. Promote the right education

The educational process will need to be altered to meet the future needs and skill-sets of automotive professionals calling for close collaboration with leading universities and schools. Coming from a highly technical/technological driven skill set being predominant in the automotive sector, new job families will have to be promoted and included such as UI/UX (User Interface/User Experience) design, digital communication and marketing, in-vehicle content creation, and customer touch point development, to name only a few.

3. Talent Acquisition and Promotional Programs

Scholarships, internships, and young talent programs suited to the new needs of automotive OEMs will have to target, attract, and bind talent at an early point in time of their career. This will include a refocusing of existing programs and a close interaction with Human Resources and agile hiring companies.

18.3 Developing new partnerships

With the upcoming diverse trends in the field of connected services, digitalization, customization and electrification, various OEMs, suppliers and service providers - including totally new entrants adding totally new business offerings to the automotive environment - will be needed to act collaboratively and work by sharing partnerships. Therefore, develop shared R&D, production and ultimately shared revenue stream models.

1. Seamless Development

Integration of third party development of non-traditional/non-OEM related technologies will be key to prevail in the race for customer relevant features, services and products. These partnerships will provide what we expect to become a much more '*consumer-centered*' car development, production, marketing and sales.

2. Collaborate & adapt revenue models

As we see the consumers' preferences shifting towards more segmented vehicles they want seamless car-buying experiences as a motivation for fast transactions. These changes in customer demands and attitudes will compel the industries to cope with. OEMs will require new ways of collaboration with suppliers and experts that of even outside the auto industry as a result of rise in technological innovation. However, OEMs will still require maintaining control over their – then changed share of – individual revenue generation and value creation.

3. Adapt the normative system

Additionally, these new partnerships will need to leverage their combined knowledge to influentially drive the corresponding development of regulatory norm architectures together with governmental organizations (GOs) and non-governmental organizations (NGOs), ultimately leading to an adapted code of automotive norms and regulations (e.g. autonomous driving, car-to-car communication, data security norms etc.).

18.4 Reshaping the Value Proposition

OEMs will need to find appropriate strategies to provide answers to the upcoming need of integrated mobility services.

1. Relevant Products

Advanced product positioning and differentiation will be required in order to optimize the market approach and offering, ultimately providing relevant, customer focused products encompassing digitally connected, end-to-end user experience.

2. Seamless Experiences

Customers will be asking for seamless experience, transferable personas, content rich car environments and rapid implementation of innovations. Product life cycles will have to accelerate and the flexibility to update and upgrade vehicles over the air will become a necessity catering to these needs and customer expectations.

3. Added Value and Customer Centricity

More agile products will ask for a highly-differentiated positioning, focusing less on today's approach, stressing vehicle type, engine, or superior design. Instead, in-car adaptability, services relevant relative to the customer expectations, and a customer communication loop focusing on added value, individualized touchpoints, and seamless experience will need to be created. Apps and digital hubs that guarantee for these touchpoints, and learn with their customers in parallel, must be created. This will allow for a more individual customization of customer communication, product and service offering, and business conduct.

4. Close loop Customer Interaction

Building on the above-mentioned customer communication hubs, it will become transparent that the traditional OEM's approach of proprietary vehicle development, concentrating solely on the product and nearly neglecting to engage with their customers in the pre- and after-purchase process, is no longer sufficiently fulfilling the needs of Generation Y and Z.

Therefore, the OEMs must adapt, providing relevant offerings; otherwise, they simply won't be able to meet the call for ongoing interaction of brands with their customers. Among these, the following can be offered:

- Building up, and establishing an industry standard for transferable consumer personas that then can be branded and made a USP such as:
 - feature and experience related vehicle upgrades
 - individualized maintenance offerings
 - value adding loyalty programs
 - individualized in-car content delivery (music, video, contacts etc.) suited to the individual customers.

To a certain extent, this will make the boundaries of the traditional automotive industry, and the OEM's market place change, or even disappear.

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List of abbreviations

| | |
|------|--------------------------------|
| OBD | On-board diagnostics |
| ECU | Electronic Control Unit |
| V2V | Vehicle-to-Vehicle |
| ADAS | Advanced Driver Assist Systems |
| P5F | Porters 5 Forces |
| NMS | New Mobility Solutions |
| NRE | Non-Recurring Engineering |
| UID | User Interface Design |
| PND | Personal Navigation Device |
| RIM | Research in Motion |
| HON | Hierarchy of Needs |

List of pictures

| Figure/Picture | Page |
|---|-------------|
| • Figure 1: Influence Model – Customer-Industry-Society | 16 |
| • Figure 2: Influence Model – Behavioral Economics | 17 |
| • Figure 3: Behavioral Economics model. | 18 |
| • Figure 4: Behavioral strategy to combat choice overload | 24 |
| • Figure 5: Influence Model – Customer Journey | 29 |
| • Figure 6: Traditional consumer funnel | 30 |
| • Figure 7: Consumer Decision Journey | 31 |
| • Figure 8: Influence Model – Trends-leg | 36 |
| • Figure 9: High-disruption model automotive revenue pool development via connected technology | 40 |
| • Figure 10: Automotive revolution perspective towards 2030 | 41 |
| • Figure 11: IBM SELF-trends | 45 |
| • Figure 12: Ideal use cases for different modes of transportation | 48 |
| • Figure 13: Market characteristics of NMS | 50 |
| • Figure 14: Influence Model – Trends & Customer-leg | 52 |
| • Figure 15: Consumer generations – Shopping experience | 53 |
| • Figure 16: Millennials versus Gen Z | 53 |
| • Figure 17: The personal car as a preferred mode of transportation | 55 |
| • Figure 18: Sources used to find information on cars | 57 |
| • Figure 19: From Product-Focused to Customer-Centric | 59 |
| • Figure 20: Appeal of new store formats to customers | 61 |
| • Figure 21: Influence Model – Business Structure-leg | 63 |
| • Figure 22: The Five Forces of Porter | 65 |
| • Figure 23: Porter's five competitive forces: Key internal interdependencies | 67 |
| • Figure 24: Passenger Car Registration EU | 69 |
| • Figure 25: World-wide vehicle registration split | 69 |
| • Figure 26: Average EBIT margin automotive | 76 |
| • Figure 27: M&A deals – volume and value | 81 |

- Figure 28: Global Smartphone OS Market Share 93
- Figure 29: Smartphone sales 2007 - 2016 94
- Figure 30: Global smartphone market share 2016 98
- Figure 31: IT Infrastructure of a Connected Vehicle Ecosystem 107
- Figure 32: Vehicle cyber attack areas 108
- Figure 33: Hierarchy of Need (HON) for IoT. 109
- Figure 34: Influence Model – Offering-leg 111
- Figure 35: Competitiveness of OEMs in the
Connected Car arena 112
- Figure 36: BMW’s Connected Car ecosystem 122
- Figure 37: Influence Model – Recap 1 129
- Figure 38: Influence Model – Recap 2 138
- Figure 39: Influence Model – Conclusion 142

List of tables

| Table | Page |
|---|-------------|
| • Table 1: Sales volumes per brand in the European Region per brand in 2015 | 70 |
| • Table 2: Sales volumes per brand in the European Region per brand in 2015 Innovation ranking by the Boston Consultancy Group in 2016 - Automotive | 71 |
| • Table 3: World-wide vehicle production of passenger cars 1997 ~ 2016 | 87 |
| • Table 4: Key financial indicators of 3 German OEMs in 2016 – BMW, Daimler & Audi | 88 |
| • Table 5: Results of Porter’s 5 Forces Assessment – Automotive Industry | 92 |
| • Table 6: Results of Porter’s 5 Forces Assessment – Mobile phone Industry | 102 |
| • Table 7: Audi Models included in Connected Car offerings assessment | 114 |
| • Table 8: Overview and scoring of Connected Car offerings – Audi | 115 |
| • Table 9: Overview and scoring of Connected Car offerings – BMW | 118 |
| • Table 10: Overview and scoring of Connected Car offerings – Mercedes (Daimler) | 123 |
| • Table 11: Summary scoring of Connected Car features – Audi, BMW and Mercedes (Daimler) | 126 |