Digitalisation of the Industry from the AUTOmobile to the autoMOBILE

4

In the United States, trams disappeared from local public transport in 45 cities from the 1930s onwards, until the practice of closing down tram networks was banned by the Supreme Court in 1956. In 1974, US government attorney Bradford Snell [26] revealed to the public that a powerful lobby made up of vehicle manufacturers, led by General Motors, oil companies, the tyre industry and supplier companies disguised as a holding company, had systematically destroyed the public tram networks. Their companies had been sold off and closed down. Bus lines and individual transport were what replaced them. This had nothing to do with the logic of market economics. It was the power and influence of monopolies which made this destructive action possible – not a conviction that they would be able to do a better job.

The times during which vehicle manufacturers saw public tram networks as direct competition they had to fight, are long since over. However, in a reality in which differentiation of core business in the markets leads to ever more complex AUTOmobiles, while – as a result of digitalisation and connectedness, improved transport planning is brought about thanks to intelligent links between different transport modes such as your own vehicle, bicycle and – yes – the tram, mobility behaviour is bound to change if the alternatives to one's own vehicle have been improved.

The crucial factor behind the shift of focus from the AUTOmobile to the autoMOBILE is the following:

> Travelling in order to reach a destination is part of human nature.

And humans can do this using the AUTOmobile, which has developed in a unique way over recent decades thanks to the individual and diverse ways in which it can

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be used. The fundamental question is, however:

> In future, will the extremely versatile AUTOmobile be the only efficient and individual transport mode?

It must be recognised that there are new, flexible mobility concepts being developed on the market which create demand without putting the AUTOmobile in the spotlight [20]. It will therefore be even more significant to take a holistic view of spatial mobility via the interplay between different concepts and transport modes. The focus of this chapter will be on whether and to what extent the business architecture elaborated in Sect. 3.7 is changing the automotive industry.

It is quite clear that the mobility market which is developing today is not going to wait for the automotive industry, and can also redefine itself independently from the automotive industry. Markets which were once separate are now becoming intertwined and are growing together. The market forces include not only the current competitors of the automotive industry, but also their suppliers and customers, new market players, or possible replacement products or services.

Before we elaborate on a possible business architecture of the mobility industry for the changing autoMOBILE, we will put together a summarised market analysis. In addition to vehicle manufacturers, we will also take a particularly close look at public transport companies [8], technology and electronics companies [13] and mobility service providers [20] with their new concepts. All four come from different directions to develop market forces for a mobility industry. Inevitably, competence areas from all four impact directions will grow together to form new business competences.

As the four market forces mentioned are still only at the beginning of their development, it still remains to be seen who will play which roles in the mobility market of the future. In certain situations, further company groups may be added to these – such as energy suppliers, which can give more to the electric mobility market than just energy for charging – for example by providing infrastructure components such as charging stations. The main focus of our analysis [5] will be on the four different competition forces which we presented in Fig. 4.1. Market forces cannot be considered as either right or wrong. The combination of services with the appropriate qualified products will fashion a new path towards an attractive, individual form of mobility. Things will become exciting if the mobility industry develops as an industry branch in its own right – which makes it possible for spatial mobility to fulfil individual requirements. But what characterises the core competences of the four market forces in the context of spatial mobility?

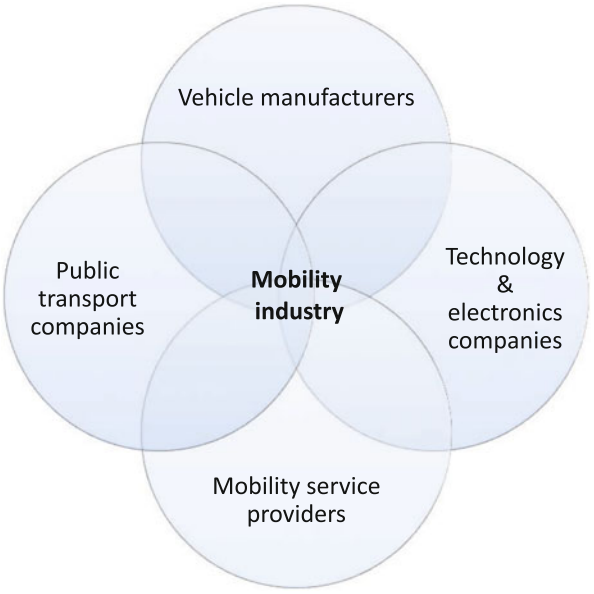

Fig. 4.1 The four market forces of vehicle manufacturers, public transport companies, technology and electronics companies and mobility service providers can also come together from different directions with their different business competences to form a mobility industry

Vehicle Manufacturers

Vehicle manufacturers have very strongly developed business competences in the global and complex process which is product development, in cost-optimised procurement, and in the international standardisation of production techniques. It is only with the help of these far-reaching competences in the three heavyweight business domains

1. "Research and development" (see Sect. 3.6.2),
2. "Procurement and inbound logistics" (see Sect. 3.6.3) and
3. "Production" (see Sect. 3.6.4)

that complex vehicles can be manufactured in accordance with today's standards. The AUTOmobile will remain a central product – even if individual requirements in terms of spatial mobility are the focus of services. On the basis of this expertise, vehicle manufacturers have excellent conditions for being able to also offer individual added value services in the broader context of mobility – the autoMOBILE. However, the strongly focused product orientation of the three business domains listed requires a change in the value creation chain within the overall framework of the automotive industry – towards a stronger orientation towards revenue on the markets from the perspective of a service provider, without a direct link to a product.

Of course, the weighting of the three most significant business domains is not the same for all vehicle manufacturers. For example,

- Honda has particular strengths in "research and development" [22],
- BMW has particular strengths in "procurement and inbound logistics" [21], and
- Toyota is particularly strong in "production" [12]

Furthermore, vehicle engineering as it has been up until now in an urban context must also surrender to other concepts and challenges if a manufacturer is also to become a fleet operator.

Public Transport Companies

In large conglomerations, public transport companies have until now been the top dogs, with almost no competition at all. The underground network in Tokyo, for example, consists of 13 lines and 274 stations, and keeps an average of 8.7 million passengers on the move every day (see Table 4.1).[1] However, this only represents 22 % of the 40 million people who travel in the Japanese capital each day. Just within 1 day, an average of 3.5 million people pass through the Shinjuku train station in Tokyo – making it the busiest train station in the world in terms of passenger numbers.[2]

In short, therefore, the public transport companies have excellent competences in terms of transporting large numbers of people in a safe and environmentally-friendly

Table 4.1 The ten busiest metros in the world

City	Country	Passengers per year	Passengers per day
Tokyo	Japan	3.17 billion	8.7 million
Moscow	Russia	2.392 billion	6.6 million
Seoul	South Korea	2.05 billion	5.6 million
Shanghai	People's Republic of China	2 billion	5.5 million
New York	United States	1.84 billion	5.042 million
Peking (Beijing)	People's Republic of China	1.83 billion	5.02 million
Paris	France	1.473 billion	4.035 million
Mexico City	Mexico	1.41 billion	3.882 million
Hong Kong	People's Republic of China	1.32 billion	3.76 million
Guangzhou	People's Republic of China	1.18 billion	4.392 million

[1] "The largest METRO in the world" http://de.globometer.com/zug-metro-tokio.php. Accessed: 12 January 2015.

[2] "Shinjuku Railway Station, Tokyo, Japan" http://www.railway-technology.com/projects/shinjuku-railway. Accessed: 12 January 2015.

way, without needing much infrastructure or space. It is possible to travel quickly and efficiently using public transport if

1. there is a sufficient number of stations,
2. there is a high number of transport modes in operation, and
3. a personal route planner puts together the different transport options in a way which is attractive in terms of both time and costs.

At the same time, urbanisation demands new mobility concepts which go beyond local public transport – as a consequence of which it is not only the vehicle manufacturers who are under pressure, but also regional transport authorities, who must seek new solutions. Users want to make the most of all system advantages of all transport modes as best as they can. In this way, a multimodal mobility concept would be very advantageous in many situations – for example, when electric vehicles not related to the station are cleverly combined with public transport, which is less limited in terms of the distances it can travel. However, the information and ticket systems used up until now are not flexible enough to the individual needs of passengers.

Technology and Electronics Companies

Technology and electronics companies have built up modern information technology which makes many comfortable, intuitive interactions possible in terms of the networking of services and linking people. It is the technological possibilities which make many services attractive in the first place, thanks to the fact that they can be used on the move. Companies such as Apple or Google, for example, create platforms on which it is possible not only to book everything from a mobile device, but also to use and be invoiced for the services of different companies in a standardised way. It should also not be forgotten that due to digitalisation, the need for people and objects to change their spatial location becomes unnecessary in many situations. For example, data transfer via the internet is replacing the post office more and more often – mainly because over the past 25 years, Microsoft has digitalised many tasks in today's office environments in private and industrial contexts. Video conferences can also reduce the need for travel by satisfying the need for simultaneous transfer of information between people in several locations.

During the past 10 years, technical possibilities have placed the focus on mobility in our society from the AUTOmobile to the autoMOBILE. It is worth reflecting on the past 50 years, which have seen just a handful of technology companies dominate the market: IBM with hardware, Microsoft with software and Google with the internet search which leads to other functions. Why shouldn't Apple reshape a personal, intuitive form of mobility? And why shouldn't Japanese electronics companies such as Hitachi, Panasonic or Sony follow closely behind them, from their different perspectives from sectors such as mechanical engineering, household appliances or entertainment electronics?

Chair of the Board of Directors of Daimler Dieter Zetsche has the following to say on the issue: "We currently have the whole value creation chain in our

hands".[3] It is very unlikely, however, that he means the continually rising value creation share of the suppliers, which is already over 71 % (see Sect. 1.3), and just as unlikely that he means the infotainment systems [15] which have been bought in addition, which will be crucial in the activities inside the *travel capsules* of the future. And even though moovel is starting new, ambitious mobility concepts aimed at broadening vehicle manufacturers' value creation chains, Google is casting a long shadow as it presses ahead with new ticket concepts and exchange formats for data on local public transport such as "General Transit Feed Specification" (GTFS).[4]

Mobility Service Providers

Mobility service providers have only been on the market for a few years, and are very young in comparison to the other three market forces. They are only at the beginning of the maturing process and usually only have minimal options for investment – but they develop many radical innovations in mobility. There are some pioneering companies which have stronger finances, but it is nonetheless also possible to build up business with only very low assets. Despite all the criticism levelled against it, and despite legal wrangling with the authorities in many countries and cities, the travel service agency Uber has managed to achieve a market capitalisation of 40 billion USD.[5] While some concepts are not yet fully formed, digitalisation means that they are able to break into established business monopolies and reshape them, as a result of which they gain more acceptance from young people.

One of the fundamental competences offered by mobility service providers is the ability to seamlessly connect many heterogeneously distributed systems with each other, with transport infrastructures and other mobility providers in order to make individually tailored mobility solutions available based on these. Many of the solutions which have been around up until now can be seen rather as research projects which will disappear again after learning curves and experiences have been had. Many ideas also lack an economically viable concept which will allow them to exist in the long term. In business models which reflect the mobility behaviour of customers in new life models, the *virtual* keys between the customer and the service are always apps and smartphones. This results in the development of the crucial core

[3] "Zetsche views competition from Apple as something positive". http://www.automobilwoche.de/article/20150303/AGENTURMELDUNGEN/303039957/zetsche-sieht-konkurrenz-durch-apple-poitiv. Accessed: 4 March 2015.

[4] "Transit – Google Developers" http://developers.google.com/transit. Accessed: 12 January 2015.

[5] "Travel service agency Uber: Value estimated at 40 billion dollars" http://www.handelsblatt.com/unternehmen/handel-konsumgueter/fahrdienst-vermittler-uber-bewertung-auf-40-milliarden-dollar-geschaetzt/11036120.html. Accessed: 12 January 2015.

competence of customer loyalty, and closeness to the mobility service provider. It is still not known how brand identity can develop in a similar way to that of a vehicle manufacturer.

4.1 The Automotive Industry in Times of Change

In Sect. 3.1, in the context of competition, we introduced the strategy as part of where a company is placed in relation to its surroundings. We will start by bringing together the external surroundings, the market forces and their effect on the automotive industry. While this will not be a comprehensive analysis, it will nonetheless give a sufficient insight into the changes being experienced by the business environment. Building on this, possible transformations of the business competences into a business architecture of the mobility industry for the autoMOBILE are to be derived.

4.1.1 Analysis of the Environment of the Automotive Sector

We will start with the PESTLE business analysis model[6] [7] as an orientation, in order to get an overall picture of the external environment of the automotive sector and the driving forces at work within it. The analysis concentrates exclusively on identifying external influencing factors which cannot be directly influenced by individual automotive companies, and which do not make it possible for them to use any simple solutions or short-term actions. It helps to classify the environment, and to understand long-term trends. Specifically, the abbreviation PESTLE stands for the

- political,
- economic,
- socio-cultural,
- technological,
- legal and
- environmental/ecological

influencing factors of an environment analysis.

There are mutual dependencies between the six factors, which mean that the discussion topics cannot always be allocated clearly to just one category. The fundamental aim of the model is to summarise the market risks and opportunities according to different factors. This means that changes can be connected in a more

[6] Sometimes referred to as PESTEL or just PEST analysis. All of these are the same type of external environment analysis, however.

targeted way with business competences which are responsible for the growth or decline of business within the company.

It is important to recognise that digitalisation no longer influences the automotive sector as a technological factor alone – instead, it influences the business environment in terms of all six factors of PESTLE – something which we will now discuss. Table 4.2 summarises the main influences.

Table 4.2 PESTLE analysis of the external influences of the automotive sector in the digital age

Politically	• Stability and reliability of political systems
	• Role of governmental organisations in shaping the economy
	• Politically supported changes and networks at a global level
	• Freedom, privacy and security in the digital age
Economically	• Stability of the currency
	• The automotive industry as a supporting pillar of the economy, with a high degree of influence
	• Shift of growth from industrial countries to emerging economies
	• Continually increasing dependence on numerous raw materials
	• Economic competition for raw materials in the global context
	• Vehicle data create economic advantages
Socially	• High employment levels in the value creation chain of the automotive industry
	• Brand identity is valuable in society
	• Growing demand for personalisation
	• Increasing urbanisation changes mobility needs
	• Residential areas are becoming less car-friendly due to more sustainable town planning
	• Ageing population in industrial countries
	• Decreasing enthusiasm for car ownership among young people
Technologically	• Sites with a strong presence of certain technologies
	• Alternative drive technologies
	• Vehicles as part of personalised networks
	• Networked factories and digitalised value creation chains
	• Staff workplaces which are shaped by technology
Legally	• Harmonisation of technical regulations at an international level
	• Standardised connected vehicle services in several countries
	• High liability provisions
	• Emissions standards for exhaust fumes CO_2-efficiency of new vehicles
	• First attempts at regulations for autonomous vehicles
	• Increasing demand for intangible information such as vehicle data
Ecologically	• Increasing awareness of environment and health
	• Alternative drive concepts with new environmental risks
	• Taking into account recycling in vehicle engineering as well
	• Mobility services from “stationary” vehicles to moving ones

The table should not, however, be seen as a general checklist. For a strategic evaluation of the external environment, one must concentrate on the most important factors for the company in question – which also have real relevance in the specific company context. The relevant influencing factors require prioritisation with a more in-depth analysis of possible future consequences for the specific company than we can provide generally here. For example, in this section we will show how currency risks or raw materials can have a considerable external influence on the automotive industry. In Sect. 3.1.1 we used the example of the BMW company strategy to show that there can also be specific measures to minimise the influences.

Political Aspects

The automotive industry is involved in politics in regional, national, transnational and global contexts. For automotive companies, the most important factor of the political environment is the stability and reliability of the political systems in those countries served by the sales markets. In countries such as Brazil, Russia, India and China in particular, political instability can have negative effects on the consumer behaviour of the locals, which also leads to investment risks for the automotive industry. An example of this is the conflict in Ukraine, which was one of the factors which led to a drastic fall in the value of the Russian currency from mid-2014 onwards. One of the consequences of this was that the Russian car market collapsed. Until now, the western sanctions against Russia and the sanctions imposed by Russia in response to these have only affected passenger vehicle manufacturers indirectly. If the situation were to escalate, however, it would not be possible to rule out a total import ban directed against Western vehicle manufacturers. Such a political situation can indeed have effects on a mobility service provider, but if there are no assets associated with the country affected, then these effects will be less significant than those on a vehicle manufacturer.

This brings us to another very important political factor – the role of governmental organisations in shaping economic life – for example through trade restrictions, subsidies, competition regulators, security regulations and market entries where a licence must be obtained, or by limiting or even preventing access to raw materials. Many political interventions result in regulations and legislation which, for the sake of clarity, we will list under legal factors.

One special political event which had a huge, one-off effect on the automotive industry was the reunification of Germany. In 1991 and 1992, this event caused a huge rise in demand for new vehicles in the former East, which resulted in record numbers of new vehicles being registered.

In 2009, Germany saw almost as many newly registered vehicles as it had done in 1991, after the Federal Cabinet passed the Directive to Encourage the Sale of Passenger Vehicles on 14 January 2009, which is also known colloquially as the “scrappage premium”. In the USA, following the collapse of the US bank Lehman Brothers in September 2008, the crisis also affected vehicle manufacturer General Motors. On 1 June 2009 it had to bring in the administrators, thus bringing about

the largest insolvency proceedings in the history of the United States.[7] Due to its bailout from the state, General Motors had to endure the insult of being nicknamed "Government Motors" for a few years.[8] The success of the German scrappage premium led to other countries using this method to alleviate the effects of the crisis as well. At the same time, records such as these are just one-off effects which do not reflect long-term market developments – especially as records are always followed by a slump.

More crucial in the long-term are global changes and networks which are supported by policy and types of political influence change as well. The development of the European Union can be cited as an example, as can the increase in more global trade agreements and international organisations, which are gaining ever more political influence. A recent example is the CETA (Comprehensive Economic and Trade Agreement), which was made public at the end of negotiations on 26 September 2014, but which is yet to enter into force.[9] The interest of the European automotive industry is substantial, because the broadening of trade – via tariff cuts and the minimisation of the numerous export restrictions which are still in place – results in many advantages for the export and sale of vehicles.

Overall, politics has a great supporting influence on the growth of the automotive industry. But how does it deal with digitalisation, which is becoming ever more relevant?

The role of politics in issues of freedom, privacy and security in the digital age is yet to be clarified. Hardly anybody is prepared to pay extra for prescribed IT security in their vehicle, but the question of whether a liberal state may/should force citizens to protect their lives in a better way remains controversial. The situation can be compared with that in the 1970s, when many car drivers vehemently opposed the introduction of seatbelts. Behind this is the basic fear of becoming trapped and not being able to run away from a situation of danger. After several years of wearing a seatbelt being an obligation but failure to do so not being punishable, fines were introduced – resulting in a steep rise of those wearing them from 60 to over 90 % ; the discussions about the sense of seatbelt regulations have since died down. Nowadays, similarly emotional language is used in the context of the emergency call system eCall to refer to "motorists in glass houses" and comprehensive monitoring structures.[10] In contrast to the issue of the seatbelt,

[7] "Obama promises a better future for GM" http://www.zeit.de/online/2009/23/gm-insolvenz. Accessed: 19 December 2014.

[8] "U.S. Remaining Stake in General Motors: Detroit Auto Maker's Bailout Cost Taxpayers $ 10.5 Billion" http://online.wsj.com/articles/SB10001424052702304744304579248001805812732. Accessed: 19 December 2014.

[9] "Canada-EU free trade deal could change auto industry" http://www.cbc.ca/news/canada/windsor/canada-eu-free-trade-deal-could-change-auto-industry-1.2125174. Accessed: 19 December 2014.

[10] "The danger lurking in the eCall emergency call system" http://www.welt.de/motor/article125249980/Welche-Gefahr-hinter-dem-Notrufsystem-eCall-lauert.html. Accessed: 19 December 2014.

however, the usefulness of possible IT protection measures is yet to be clarified. In the case of many new technologies, it takes time for it to become apparent whether its usefulness outweighs any disadvantages.

Economic Conditions

Of course, currency and its stability are at the centre of economic factors. As the automotive industry develops, produces, sells and services its products internationally, factors such as exchange rates, inflation rates, economic growth and economic cycles have a central influence on business and the resulting revenue – especially for those companies which export high numbers of vehicles and replacement parts. Further factors such as taxation, interest, availability of resources and unemployment, for example, are relevant to decisions on locations for production or administration.

According to the annual figures published by the German Association of the Automotive Industry, the turnover of the entire automotive industry in Germany in 2013 was €361,767 million.[11] This means that this industry branch contributes around 20 % of the turnover of the manufacturing industries in Germany, making it a supporting pillar of the German economy with a correspondingly high level of influence.

Over the past few years, worldwide economic growth has shifted from traditionally stronger industrial nations such as the United States, Japan, Western Europe and Canada to move towards the so-called emerging economies such as Brazil, Russia, India and China, but also to countries which have until now been referred to as developing economies, such as those in Africa. In the case of the automotive industry, this is due to the very low or even negative population growth rate in the traditionally stronger countries – but also because they are to a large extent saturated with cars, and vehicle numbers are limited by the number of parking spaces each household has. There are many statistics which indicate the number of vehicles per 1000 inhabitants.[12] While their ways of counting are not standardised – in terms of commercial vehicles, for example – it is possible to agree on the fact that in Germany or Japan there is an average of one vehicle per two inhabitants; while the number of vehicles per inhabitant is even higher in the United States. More important than exact figures, however, are comparisons with countries in which the number of vehicles per inhabitant is much lower than it is in industrial countries. The resulting economic potentials cannot, however, always necessarily be expected to be the same as actual consumer behaviour. Political instability has already been mentioned as a possible influencing factor. This is also accompanied by the problem of environmental degradation – in addition to the question in which situations public transport makes more economic sense [10].

[11] "German Association of the Automotive Industry – Figures and data" http://www.vda.de/de/zahlen/jahreszahlen/allgemeines. Accessed: 19 December 2014.

[12] "Ranking: The ten countries with the highest density of passenger vehicles, Spiegel Online" http://www.spiegel.de/auto/aktuell/ranking-die-zehn-laender-mit-der-hoechsten-pkw-dichte-a-684947.html. Accessed: 19 December 2014.

Neither should we neglect to mention the dominance of oil products and the influence of the price of crude oil – which continue to have a formative influence on the automotive industry. While work has been going on for some time, there is still a long way to go until the vehicle manufacturers will be able to reduce this dependence significantly by using alternative drive types. Only very few companies, such as Tesla Motors and their clients, are slightly less dependent on oil than the average vehicle manufacturer.

And oil is far from being the only raw material which vehicle manufacturers – along with a far-reaching chain of suppliers – are dependent on. If we take a closer look, we see that there is a continually increasing dependence on numerous raw materials which is linked not only to increasing production figures, but also to the ever growing quantities of raw materials which are needed in order to produce a single vehicle. Over the past decades, all vehicles have significantly increased in weight. The weight of the first Golf I by Volkswagen in 1974, for example, varied between 750 and 970 kg depending on the version and equipment in question; the seventh model – the Golf VII, which came onto the German market in autumn 2012, weighs between 1205 and 1395 kg. While the larger dimensions of the models contribute to this increase in weight, the main factor is the multitude of technical parts which have been added during the past decades, and which fulfil a broad range of tasks in the areas of performance, safety, reliability, economic viability, comfort and entertainment etc. A more precise presentation can be found in Sect. 2.3. While the lightweight technology used by BMW helps to reduce the vehicle's weight, it does not do anything to get rid of the continually growing dependence on many raw materials. Nowadays, the automotive industry is one of the largest users of microchips, steel, iron, aluminium, copper, lead, textiles, plastics, vinyl, rubber, and also has an increasing need for rare earth elements.

During the past few years, especially thanks to its automotive industry, China is no longer present on the market just as a supplier of raw materials – but has also become a large source of additional demand. This has also resulted in a clear rise in economic competition for raw materials in a global context – something which has been heightened due to export restrictions on raw materials in China.

The question of how vehicle user data will develop as an economic factor still remains largely unanswered – or, to be more precise, whether similar dependencies will develop in new value creation chains in this context in the future. It should no longer be ruled out that, in future, data – in particular vehicle data – will be traded on the stock market as is the case with raw materials at the moment. Simply possessing data in the context of vehicles, users and use profiles can become an economic advantage. The main risk is still to be found in the learning curve with data and investments in the "right" mobility services, which can also remain profitable in the long term.

Societal Forces and Trends

Societal factors can be divided into structural characteristics and their corresponding trends. The structural characteristics include, for example, population structure,

education, moral concepts and income distribution. The corresponding trends are influenced by demographic change, for example.

The automotive industry is of high importance to the German population. According to annual figures from the German Association of the Automotive Industry, there were an annual average of 756,021 employees in the automotive industry in 2013 – something which has a direct influence on their societal significance. This figure is even higher if one counts the companies which exist along the value creation chain independently from the automotive industry – such as suppliers of raw materials to the automotive trade and recyclers of old vehicles. By including these people as well, one comes to a total figure of 1.8 million employees [23].

How visible are companies in our society? In fact, it is rather rare for companies to be in the spotlight – for example in the case of staff strikes, or when companies become embroiled in scandals. Usually, at a consumer level, it tends to be the product brands of a company which are perceived more strongly. In the case of cars, this is particularly the case in those countries where vehicles are considered status symbols and are not only used for the specific purpose of travel. This is why brand identity continues to have very high importance for automotive companies, as we demonstrated in the context of the business competence "corporate and brand identity" in the domain of "marketing and communication" in Chap. 3.

With a focus on premium vehicles, companies invest considerably in associations such as safety, comfort, performance or reliability. If we look at our purchasing behaviour critically, we will often see that in order to be able to distinguish one vehicle from another in a "blind test", it is increasingly necessary to be an expert who is constantly updating their knowledge. Decisions tend to be made very quickly on the basis of the brand name – even if this can result in higher prices being paid.

Depending on the brand's orientation, different sectors of society are addressed in accordance with their lifestyle: Single, independent individualists have different mobility needs to those of families. Customer segments are, however, by no means static – as our society with its needs and lifestyles is in constant flux. How, for example, would we define the 'family' customer segment nowadays? Would separated parents also be included, or the rising numbers of same sex married couples? Nowadays, there are many families whose members have been brought together as a result of separations and divorces, and are sometimes referred to as "step families". The trend of bringing children from a previous relationship into a partnership is becoming increasingly common. It is no longer rare for people to have family around them during the week and then to be on their own at weekends – or vice versa. Does this mean that there are other demands on a family vehicle which need to be taken into account by the manufacturer? One thing is certain: the more diverse family circumstances there are, the more demand for individualisation increases.

The causes of changing values in society are not just a result of growing wealth and modernisation, but also of increasing urbanisation. This has direct effects on the business models of the automotive industry, and requires new mobility solutions.

As part of transport in urban or rural areas, over short or long distances, different needs arise which can only be satisfied by a range of mobility concepts. In this way, increasing urbanisation – especially in emerging economies with low purchasing power – requires the establishment of small, lightweight and manoeuvrable city vehicles alongside a solid public transport network.

Cities are not only being rebuilt due to increasing urbanisation, but also in ageing industrial societies where continuing population decline requires more sustainable urban planning [25] and urban transport planning [27]. The process of rethinking new concepts in urban development involves, for example, a more socially acceptable form of mobility by banishing cars from important parts of city centres in order to avoid car traffic as much as possible. There has been a congestion charge zone in the centre of London since 2003, while New York City is home to the best known park in the world – the "High Line Park" – which has been built over the past few years on a disused elevated railroad spur. In urban and transport development departments, there is a desire to encourage residents to start walking more again. In modern urban planning, the car – which has been considered an essential element of what residents need and want ever since the post-war era – is now included as an unwanted, necessary evil at best, and is kept out of sight or banished to the sidelines if possible. If it were possible, it would be preferable to not have to plan for them at all. Free public transport, electric bikes and other elements will make it possible to build areas of cities with reduced car numbers – something which is now being discussed more and more seriously.

Demographic change in our society also includes the ageing population in industrial countries and increasing life expectancy in emerging economies. In view of this, the automotive industry will have to adopt a more sensitive approach towards issues such as fitness to drive and drivers' health in order to make it possible to change to travel services or even public transport. Fully automated, autonomously driving vehicles [14] cannot be the only answer. Despite all the criticism levelled against it in relation to data protection, the connectivity between a vehicle and a mini computer to be worn directly on the body – so-called "fitness wearables" – can provide health protection, for example by working out a personalised, stress-free navigation route through a city, or by recommending a break in driving.

In short, there are definitely many personal preferences in our society which can be connected with a vehicle and its use. As such, it can no longer be sold as "a" fully-integrated package. Even a diverse range of models, as is the aim of customer segmenting, cannot integrate all needs.

Using a range of statistics, it can be recognised that young people's love of cars is diminishing in our society. Between 1995 and 2012, for example, the average age of German car buyers rose continuously from 46.1 to 51.9 years.[13] A fundamental reason for this is that many young people no longer consider it a priority to hold

[13] "Young people don't care about new cars" http://www.zeit.de/auto/2013-04/neuwagen-kunden-alter. Accessed: 19 December 2014.

Table 4.3 Driver's licence ownership rates among young people in the United States (*Source*: "Percentage of teen drivers continues to drop" http://ns.umich.edu/new/releases/20646-percentage-of-teen-drivers-continues-to-drop. Accessed: 19 December 2014)

Year	17 years (%)	18 years (%)	19 years (%)
1983	69	80	87
2008	50	65	75
2010	46	61	70

a driver's licence.[14] It is not only the sales of cars which are affected by this, but also their use. For example, Table 4.3 shows the continual decline in driver's licence ownership among 17–19 year olds.

Technological Developments

Technological developments affect the automotive industries in a wide variety of ways. The influencing factors include research – from public and state-financed institutions too – and the resulting new products and processes. Technological possibilities and their ease of use are also gaining more and more importance and influence in almost all industries. Here we are simply summarising just a few of the main influencing factors, as the principle permeation of digitalisation along with new technologies was introduced as part of the individual business competences in the automotive industry in Sect. 3.6.

Almost one third of all expenditure for research and development in Germany is spent in the context of the automotive industry. This means that locations in a region where certain technologies are particularly present become an influencing factor. Germany is an important location for many – but not necessarily all – vehicle technologies. Recently, for example, many automotive companies and suppliers have invested in new research and development locations for infotainment systems [15] and connected vehicle services in Silicon Valley [11] – which is not a place in the usual sense of the world, but more an attitude held by creative people who change the world. It is shaped by anti-cyclical business cultures, and has established itself as the home of Apple, Google, Facebook, Oracle, Intel and Stanford – among others. Spatial proximity to the developments of digital technologies and of large and small creative young companies makes it possible for the automotive industry to keep up with and collaborate closely with entertainment technologies. Proximity to the IT companies helps to place the precision of engineers in the foreground, in addition to shaping values such as safety and comfort, as well as social and digital networking.

[14] "Driver's licence no longer a status symbol: Driving is out, smartphones are increasingly important" http://www.faz.net/aktuell/technik-motor/auto-verkehr/fuehrerschein-kein-statussymbol-autofahren-ist-out-smartphones-werden-wichtiger-13346242.html. Accessed: 19 December 2014.

The alternative drive technologies which are different to the common combustion engine in terms of their energy source or engineering concept are being given increasing levels of attention. There is still hope that it will be possible to solve the problems of environmental pollution and the depletion of fossil fuel sources. It is still uncertain, however, which alternative drive technology will catch on in future – something which could lead to costly misinvestments. Neither is it clear how significant the actual improvement to environmental degradation may be, or the reduction in dependence on finite resources. The electric drive is an alternative drive concept which is still in the early stages of development, but which is believed to have great potential. Hydrogen and biogas are two examples of alternative fuels which do, however, present numerous challenges for passengers and the environment in terms of sustainability, acceptable refuelling procedures and safety. Toyota is making progress in a new direction all of its own, and is presenting the series version of a hydrogen-powered fuel cell car in Japan.[15] Both manufacturers and suppliers still need to build up a lot of knowledge about key technologies for alternative drive concepts in a broad range of countries, as a result of which the market and manufacturer positions which have existed until now could change. The countries' governments also play a significant role in supporting infrastructures for alternative drive technologies such as charging stations.

Constantly increasing network speeds and bandwidths combined with falling costs for data transfer influence mobility services and possibilities within the vehicle. The current LTE (Long Term Evolution) mobile technology, for example, makes it possible to transmit about ten times as much data in practice as the third generation UMTS (Universal Mobile Telecommunications System). Growing networks and customer needs integrate vehicles into personalised networks with technical framework conditions which are unknown during vehicle development.

Many production procedures have a long history in the automotive industry. Thanks to the government support programme Industry 4.0 in Germany the network of factories and digitalisations in manufacturing processes and techniques are seeing long-term, far-reaching changes [2].

It must also be mentioned that there is great potential for technical knowledge and experience gained by staff in a private capacity to be used in the workplace too – by creating free spaces for technology. While our main focus here is not on how companies are being challenged by demographic development, it must nonetheless be taken into account that this phenomenon is changing the extent of the knowledge gained in a private capacity by staff who are older on average, and the expectations of the young so-called "Generation Y", who attach importance not only to work-life balance, but also to the appreciation of their competences, and who are shaped by their interacting with a broad range of technologies every day.

[15] "Toyota's series car with fuel cell: The advance of hydrogen" http://www.spiegel.de/auto/aktuell/toyota-mit-wasserstoff-antrieb-fcv-faehrt-mit-brennstoffzelle-a-977331.html. Accessed: 19 December 2014.

Legal Framework Conditions

There are legal framework conditions on many levels, which tend to be perceived by industry as restrictions and sources of extra work alone. In particular, the automotive industry has to take into account national and international legal provisions and regulations throughout the life cycles of its products. In some situations, legal framework conditions are standardised at the level of a union of states such as the European Union. Local interest associations, on the other hand, are often active on the community and regional levels in automotive companies, but they can have significant effects on the ability of a company to perform.

The central task of international organisations remains continuing to harmonise technical provisions for vehicles at an international level. The UN Convention on the United Nations Economic Commission for Europe (UN/ECE) was signed in the 1950s, and currently has 49 signatories.[16] Since 1998, there has been work towards a global agreement,[17] which as yet includes no approvals or certification processes, however. For legal reasons, it will not be possible for there to be a vehicle which is standardised at a global level – even for several decades. Legal framework conditions are not, however, the sole reasons for the high level of variability between vehicle parts. Volkswagen, for example, cannot simply reduce its 350 types of exterior rear-view mirrors and 700 different bumpers to the technical basics of just a few basic models.[18] We do not necessarily have to look as far as old historical burdens in order to recognise the problems which occur when harmonising regulations. Currently, for example, the emergency call system eCall shows us that numerous legal hurdles still need to be overcome in order to make it possible to provide connected vehicle services which are standardised in more than one country.

The automotive industry is not fundamentally different from other global industries when it comes to general legal factors such as legislation, tax directives, the awarding of patents, or competition regulations. There are, however, significant differences in terms of strict liability provisions for the car industry, and the special regulations which go hand in hand with them.

At the moment, the development of three legal provisions is particularly in the focus of the public eye. These are: the taxes and emissions standards for exhaust gases and the CO_2 efficiency of new vehicles in order to reduce global warming; changing regulations such as congestion charges or road tolls; and, finally, the first attempts to regulate the development and support of autonomous vehicles [14].

Another topic related to legal framework conditions which is still in its infancy is the increasing amount of information which can be gained from electronic systems,

[16] "Vehicle Regulations" http://www.unece.org/trans/main/welcwp29.html. Accessed: 19 December 2014.

[17] "GAR – Global Technical Regulations" http://www.globalautoregs.com/gtr. Accessed: 19 December 2014.

[18] "To what extent is Volkswagen still the 'car of the people'? More types of exterior mirrors than car models" http://www.zeit.de/mobilitaet/2014-08/volkswagen-vw-probleme/seite-3. Accessed: 19 December 2014.

such as vehicle data. In this context, there are many questions which are related to the classification of data, claims to this data and liability for incorrect processing of data. We introduced this issue in Sect. 3.6.8 in the business competence "Customer and vehicle data".

Ecological Issues

Ecological factors include the increasing awareness of the importance of the environment and health in our society, which is reflected in values such as environmentally aware waste disposal – from production to the recycling of vehicles [24] and the reduction of emissions. There are still numerous challenges which need to be overcome in these areas.

It has now already been proved that the ambitious goal of reducing emissions cannot be realised by increasing the efficiency of classic combustion engines alone. Alternative drive technologies are becoming necessary – but they are dependent on numerous raw materials, and cause other environmental problems. In this way, electric vehicles are controversial from an environmental point of view, because their value for the environment is especially dependent on the way in which their electricity is generated.[19] Furthermore, the high-performance permanent magnet in the electric car cannot function without lithium and several rare earth metals, while hydrogen-powered vehicles require platinum for their fuel cells. This means that the availability of raw materials and ecological access to them is a pre-condition for the production of electric cars.

Rare earth metals only occur in low concentrations in minerals which are few and far between, and can only be extracted using costly processes. China has a global monopoly in terms of the occurrence of these raw materials and their extraction. The extraction of rare earth metals is associated with considerable environmental risks. Radioactive substances are released, while large amounts of poisonous waste are left as residue, which damage humans and the environment in the form of particles and via groundwater. Moreover, there are many small-scale mines in which no environmental protection is practised at all.

At the end of a vehicle's life cycle, it becomes more and more costly – but also more necessary – to deconstruct it into its constituent parts. The planning of vehicle engineering must take into account the options for recycling components and materials so that, in future, individual components can be dismantled easily and their raw materials can be reused [4]. Recycling is, however, a process which uses quantities of energy which should not be underestimated in terms of the separation and retrieval of various metals.

A basic requirement of vehicles is that they should be environmentally friendly. In terms of environmental and health consciousness, there is also a basic issue of how to maintain a vehicle. Why should the numerical ratio of vehicles to inhabitants

[19] "Electric cars may do more harm than good" http://www.welt.de/wissenschaft/umwelt/article135412530/Elektroautos-koennen-mehr-schaden-als-nutzen.html. Accessed: 19 December 2014.

continue to move in the direction of increasing vehicle numbers? Another no less fundamental question is the following: How long, on average, do we spend travelling each day?

Actual use times can only be estimated, as it is not yet possible to carry out a precise quantitative arrangement of all vehicles which are currently in use. We can get a rough idea by calculating parking durations as times of non-use, or by calculating the average distances which are travelled on a daily basis by certain population groups. There are many analyses and statistics on these topics, particularly on the use of parking spaces near residences and workplaces, and on the average duration of travel (see [1,9,16,29]). While these values certainly cannot be generalised, they reflect what most vehicle owners already know from their own use habits. All evaluations show an average use of between 1 and 2 h per day – which corresponds to vehicle use of between 3 and 8 %.

In the light of these figures, we can say that vehicles spend more time "stationary" than they do in motion – so, ecologically speaking, they cause a high level of pollution while only being used to a minimal extent.

4.1.2 Competitive Forces and Imminent Market Developments

Market changes have an effect on the competitive advantages of individual companies – which means that a business model which is currently successful will not necessarily survive in the long term without being modified. In this section we will deal with influencing factors which are in the direct competitive environment of the automotive industry, and of which two – digitalisation and connectedness – have a direct influence on the company. In terms of the structural analysis of sectors in the context of market and competitive forces, the "Five Forces Model" by Michael E. Porter [18] has gained credence. It helps to recognise and analyse the greatest challenges and risks which are to be found in the direct business environment. It was developed and established as an aid for strategic analysis in business planning. When using it, it should be remembered that external forces tend to affect all automotive companies. By doing so, market forces can be discussed in a way which is independent of a specific company. The success of the response to the five forces as a competitive strategy depends, however, on the different skills of the company in question. This is illustrated by the examples from Sect. 3.1.

The focus is on the rivalry between existing competitors in the sector. Current competitors are far from being the only dangers facing companies, however. In addition to the factors of the external business environment, the negotiating power of suppliers and purchasers as well as potential new market players and the threat of replacement products or services can influence the attractiveness of a business model, and can spark great changes. In total, there are five basic competitive forces

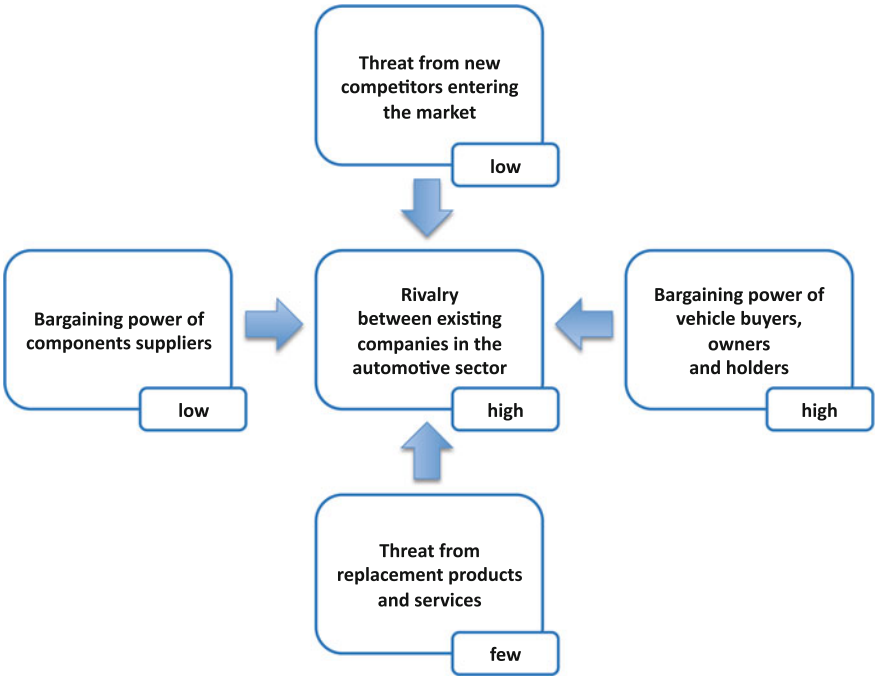

Fig. 4.2 The five market forces and their risks to sector competition, according to Michael E. Porter [19] for the automotive industry of the twentieth century

which, taken together, define the competitive intensity and economic viability of the sector. All five come from different directions to have an effect on a company. In terms of formulating a strategy, the strongest forces are what is crucial – with their characteristics which create business pressure. In Fig. 4.2 we have presented the model for the automotive industry which was valid in the twentieth century. In this diagram, the automotive industry is in a good position, because the competitive strategy basically only had to concentrate on the customer as a buyer, and on the rivalry between the existing companies. For many decades, this remained valid for as long as these two forces were the only dangers threatening to cause losses of business or prospects of gains in terms of competition.

In the twenty-first century, digitalisation and connectedness has made many value added services possible for individual mobility, meaning that the number of replacement products and services has increased very rapidly. As a result, threats throughout all of the competitive environment have increased. We clarify this in a model (see Fig. 4.3) using the extreme scenario of the existing automotive industry developing to become a supplier of the mobility industry with relatively little negotiating power.

All of the four other market forces (except for the supplier) create a great amount of pressure on business, which means that it is not attractive – at least economically

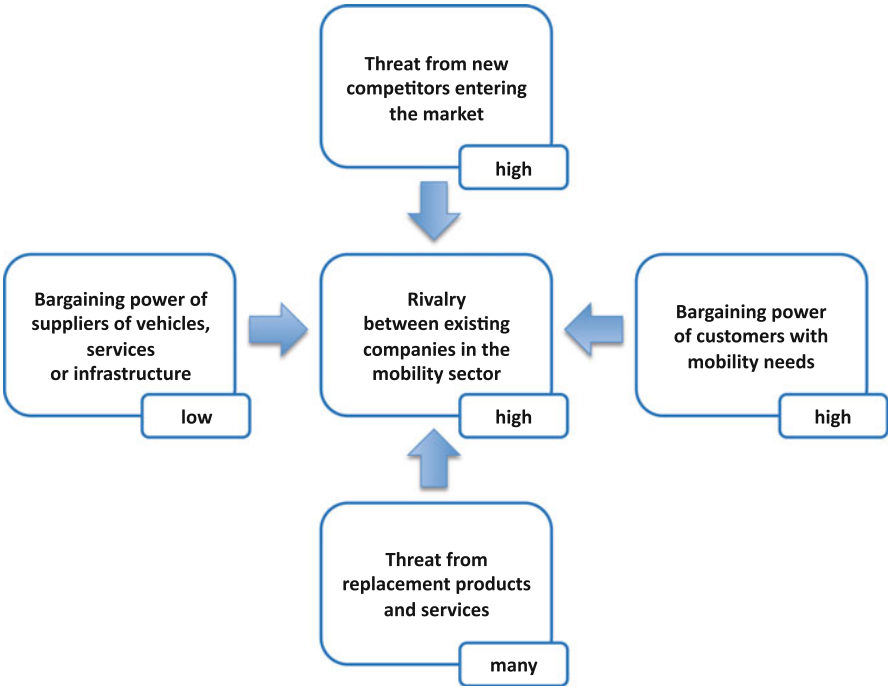

Fig. 4.3 The five market forces in the competitive model of the mobility sector

– particularly at the current time, and that it needs more sustained investment. This diagram shows which imminent challenges a vehicle manufacturer should prepare to have to deal with. The aim is to broaden the business model to include value added services for individual mobility, but at the same time to use the creation of vehicle products in order to set the business apart in the market. The mobility sector is still very young, and is yet to establish an attractive sector structure in the competitive environment. It is important for strategically well-placed companies to develop a strong position. Even though it is still difficult to create competitive advantages: Thanks to their vehicle competence, vehicle manufacturers have good prerequisites for exploiting the mobility sector. They should merely take care not to underestimate other sectors, such as parking space providers – who can use their advantages in strictly regulated countries such as Japan. After all, nowadays, parking spaces are just as essential to mobility as vehicles are – at least for as long as it is not possible to achieve 100

In the next section, we will analyse the five forces and how they can be developed.

Rivalry Within the Industry

Rivalry within the industry is becoming increasingly intensive – if not more aggressive – as chances for growth can now only be realised by taking clients from competitors. In the industrial nations, the number of vehicles sold per year

has been falling for several years. Precise figures are published, for example, by the "International Organization of Motor Vehicle Manufacturers".[20] According to them, 87,507,027 were sold in 2013. Globally speaking, sales figures have risen continually over the past 5 years – mainly because of rapid growth in China and India. There is only a finite number of new markets which can be broken into. Over a period of 9 years it has become very clear that in both Europe and North America, sales figures of new vehicles have declined. Obviously, the market is becoming saturated. Even though the world's population is continuing to grow, the end of market capacity for vehicles will be reached in the foreseeable future. Interplanetary business between markets which we cannot yet even imagine will remain a fiction for a long time to come. This is why sales and distribution in the industrial nations will mainly concentrate on existing customers, and on taking customers from the competition.

Competition is also becoming more stiff because the automotive sector is limited to fewer and fewer companies. If we look at the turnover figures of the world's largest companies as listed in Fortune 2014 "The Global 500",[21] we will notice that there are 21 automotive companies – which are summarised in Table 4.4.

We have not listed car suppliers or those vehicle manufacturers which do not produce any passenger vehicles. It would only be possible to make a precise comparison if one could concentrate on a single business area of the companies listed – such as passenger vehicles, for example. There are, however, no standardised company reports about business figures which are categorised according to a comparable product portfolio, observation period and separate subsidiary companies or joint ventures. This is not particularly relevant to our discussion of rivalry within the industry.

Table 4.4 presents the two following main insights:

- The nine largest vehicle manufacturers in terms of vehicles sold account for almost 70 % of worldwide competition in terms of new vehicles.
- The five main Chinese automobile manufacturers already account for around 16 % of total competition, even though their production concentrates almost exclusively on the Chinese market. Until 2004, Fortune's "The Global 500" did not list a single Chinese automobile manufacturer.

In short, this results in a higher level of competition within the sector, as shown in Fig. 4.2. Loyal customers with a real connection to the brand therefore become increasingly important, as described as a societal factor in Sect. 4.1.1.

While rivalry on a global level drives the globalisation of companies and their brand identities forward, this does not mean that the vehicles are necessarily standardised on a global level. They must fit in with regional requirements and

[20] "Production Statistics – OICA" http://www.oica.net/category/production-statistics. Accessed: 19 December 2014.

[21] http://fortune.com/global500. Accessed: 19 December 2014.

Table 4.4 The world's largest manufacturers of passenger vehicles, which are listed according to turnover in Fortune 2014 "The Global 500"

Company	Employees	Turnover in million	Sold vehicles
Volkswagen (Wolfsburg, Germany)	572,800	$ 261,539	9,728,250
Toyota Motor (Toyota City, Japan)	333,498	$ 256,454	9,692,000
Daimler (Stuttgart, Germany)	274,616	$ 156,628	2,353,600
General Motors (Detroit, USA)	219,000	$ 155,427	9,714,652
Ford Motor (Dearborn, USA)	181,000	$ 146,917	6,330,000
Honda Motor (Tokyo, Japan)	198,561	$ 118,210	4,323,000
Fiat Chrysler Automobiles (London, United Kingdom)	225,587	86,816 €	4,352,000
Nissan Motor (Yokohama, Japan)	160,530	$ 104,635	4,914,000
BMW Group (Munich, Germany)	110,351	$ 100,971	1,963,798
SAIC Motor (Shanghai, China)	198,000	$ 92,024	5,106,000
Hyundai Motor (Seoul, South Korea)	104,731	$ 79,766	4,732,000
China FAW Group (Changchun, Jilin Province, China)	120,000	$ 75,005	2,908,400
Dongfeng Motor Group (Wuhan, Hubei, China)	114,365	$ 74,008	2,567,700
PSA Peugeot Citroën (Paris, France)	194,682	$ 71,807	2,818,000
Renault (Boulogne-Billancourt, France)	121,807	$ 54,339	2,628,208
Kia Motors (Seoul, South Korea)	48,089	$ 43,486	2,746,000
Beijing Automotive Group (Beijing, China)	22,000	$ 43,323	2,164,000

(continued)

Table 4.4 (continued)

Company	Employees	Turnover in million	Sold vehicles
Tata Motors (Mumbai, Maharashtra, India)	66,593	$ 38,502	1,020,546
Guangzhou Automobile Industry Group (Guangzhou, Guangdong, China)	38,500	$ 32,775	1,004,600
Suzuki Motor (Hamamatsu, Japan)	51,503	$ 29,330	2,711,000
Mazda Motor (Hiroshima, Japan)	40,892	$ 26,873	1,331,000

Fiat Chrysler Automobiles, which was founded in 2014, has also been added. The data in the columns "Employees" and "Vehicles sold" are from the business and annual reports published by the company in 2014

changing needs in order for it to be possible to sell them. Japanese firms in the United States, for example, often sell American-looking vehicles which are only produced in the USA.

In the mobility sector, however, there is still no comparable rivalry on a global level.

Suppliers' Negotiating Power

Automobile suppliers are very fragmented. Above all, there are thousands of local suppliers whose entire business is very specialised and relies on mechanical, hydraulic, electrical or electronic parts and only one or two vehicle manufacturers. In Sect. 1.7 it was mentioned that, in Germany 97 % of the country's 7457 companies employ between 20 and 1000 employees. For the many specialised suppliers, it is particularly serious if a vehicle manufacturer decides to switch to another supplier, or no longer uses a certain part in construction. As a result of this, most suppliers only have minimal market power and are closely controlled by the procurement of manufacturers – especially when sales volumes are pooled. Some exceptions include suppliers of raw materials – who have a very strong negotiating position because there are only very few companies selling the same raw materials. We presented this economic factor in Sect. 4.1.1 in the context of the automotive sector.

Table 4.5 shows the few manufacturers of passenger vehicles which are listed according to turnover in Fortune 2014 "The Global 500". This handful of suppliers currently dominates[22] the market for AUTOmobiles. Electronics companies such as Samsung, Panasonic or Sony currently also supply some areas within the automotive industry. Investments within the market do, however, indicate that electronics

[22]Further movement is expected in the market during the years to come. The figures are from the end of 2014.

Table 4.5 The world's largest automobile suppliers, which are listed according to turnover in Fortune 2014 "The Global 500"

Company	Employees	Turnover in million	Share automobile (%)
Bosch (Stuttgart, Germany)	281,381	$ 61,632	65
Continental (Hanover, Germany)	177,762	$ 44,249	96
Johnson Controls (Milwaukee, USA)	170,000	$ 42,730	51
Denso (Kariya, Japan)	139,842	$ 40,885	98
Bridgestone (Tokyo, Japan)	143,448	$ 36,573	85
Magna International (Aurora, Canada)	125,000	$ 34,835	100
Aisin Seiki (Kariya, Japan)	83,378	$ 28,171	96
Michelin (Clermont-Ferrand, France)	111,200	$ 26,879	85

The data in the columns "Employees" and "Auto share" (percentage share of turnover in the business area for the automotive industry) is from the business and annual reports published by the companies in 2014

companies are observing Apple too, and are building up a negotiating position within the competitive market of the autoMOBILE.[23] Access to vehicle data is no longer controlled by the manufacturers alone; instead, suppliers with new value added services will contact the end customers directly.

Consumer Influence

For a vehicle manufacturer with build to stock production, the influence of car buyers is only minimal, as they usually only want to buy a single vehicle for private use – on occasions which are few and far between. Depending on the market and segment in question, groups of buyers have different focuses and factors in their decisions – such as age, whether they have a driving licence, whether they have access to a parking space, taxes, insurance and environmental awareness. Company cars in particular account for a large proportion of premium vehicles in Germany. In this context, consumers have negotiating positions which are different to those which can be achieved by private buyers.

[23] "Will Samsung Enter Autonomous Vehicle Market?" http://www.businesskorea.co.kr/article/9140/practical-value-exynos-will-samsung-enter-autonomous-vehicle-market. Accessed: 24 February 2015.

Nonetheless, nowadays it is possible for private buyers to be much more focused on the product they wish to buy. Thanks to digital options and different information channels, people are very well-informed – which means that the comparison of performance or prices no longer necessarily takes place on site at the dealer's.

The negotiating power of customers with individual mobility needs will increase even more if they no longer appear just as one-off purchasers. A longer-term relationship is needed with clients which goes beyond just one purchase transaction; if this is not built up, then it is much easier for the customer to switch from one mobility range to another. Loyal customers with a real connection to the brand therefore become increasingly important, as described as a societal force in Sect. 4.1.1.

Threat Posed by New Market Players

The threat posed to the traditional AUTOmobile by new market players is low – especially for vehicles with a classic combustion engine. Investment costs for product development and manufacture in capital-intensive factories, which require comprehensive advance payments and high liability risks, are too high. This makes the market entry barrier to the automotive sector a very high hurdle for ambitious young entrepreneurs with new concepts and visions. In general, the following applies: The higher the investment which is needed for market participation, the lower the probability is that a company will be able to break into the market. In the introduction, we mentioned examples of newly founded companies such as Tesla Motors and Local Motors.

The actual threat, however, is posed by new market participants with replacement products or services which also make individual mobility possible. They are acting in a mobility industry which is less and less concerned with vehicle manufacture, and also need time to build up a reputation with consumers. Companies such as Uber are already on the market with their own distribution networks.

Threats Posed by Replacement Products or Services

In the traditional automotive industry, there were only very few replacement products – such as public transport, for example. One possible approach is to strategically eliminate replacement products, as described at the beginning of the chapter using the example of the United States. Another approach is to incorporate the unavoidable factor of competition into strategy – which is occurring at Daimler, for example (see Sect. 3.1.3), with its company strategy as part of "driving forward connected vehicles and new mobility concepts".

4.1.3 Evolution, Transformation and Creation

In the two previous sections, we concluded that there is a long list of problematic developments surrounding the AUTOmobile, including

- digitalisation,
- connected vehicles,

- emissions reductions,
- too many alternative drive concepts and
- decreasing enthusiasm for car ownership among young people,

and that there are strong market forces for the creation of a mobility industry.

How is it possible to change an existing business model in the automotive industry?

By themselves, having a specific company goal or a strategically planned "right" way of getting there are not enough. It's just like with a GPS system: It can only tell the vehicle which direction to go in if a specific destination is provided, but this does not mean that it is the right route for the driver. This can only be defined by taking into account the framework provisions and priorities of the driver and the vehicle. Otherwise, the available fuel might not be enough – or the driver may arrive late for his appointment and might as well forget the entire journey. The same applies to the company-specific alteration of existing business models. Companies change in different ways in order to react to the evolving market requirements which affect them.

We will take a look at three degrees of possible changes in the automotive industry, which we define as follows in our context:

Evolution	concentrates on the development of core business, the product portfolio or exploiting and penetrating new markets by selling products. It is protected by its established company processes, and it has very high chances of success in a closed context which already functions. At the same time, however, it is only possible to a limited extent for innovations and alterations outside of the product context and the existing value creation chain – for example the rise of digitalisation within the vehicle as a result of the change of vehicle drive from a combustion engine to an electric one. The effects on the business orientation of product sales would hardly change, however.
Transformation	investigates and tests new business models step by step – outside of the company as well. It benefits from the creativity and business innovations of areas within the company which have different types of experience, researches new strategic orientations and brings about change. Often, it is protected by the company's solid financial basis – but also restricted by the goals of the existing business model. Daimler, for example, develops new digital products which make it easier for customers to do without a vehicle.[24] In terms of the transformation of its business model, Daimler sees IBM as a successful example to aspire to, as IBM

[24] "Why Daimler is its own competition" http://www.wsj.de/nachrichten/SB10001424127887323372504578468933801351120. Accessed: 19 December 2014.

developed from a business which used to be dominated by mainframes into a business model based on software, consultation and services. This is why, today, the company "is seen as being just as successful as it used to be – but with very different content".

Creation brings about new business models – even when there is only a very vague vision. It is often shaped by the establishment of new companies with very short processes, has hardly any historical burdens, and can develop very quickly thanks to its iterative trial and error methods and constant striving towards optimisation. For companies which are already established, however, it is a balancing act – because the brand identity may change, which may result in irreversible irritation among existing clients. One example is the entry of Google, which is known for its internet services, into the automotive industry – with a product which does not put the vehicle itself in the primary focus of the value creation chain – instead, the focus is on the client, who is influenced and directed using the data from his/her movement and behaviour patterns. For Google, a step like this is crucial – because its core competence of the internet search is only a "temporary strength" which is based on consumers' comfort. A vehicle involves more ways in which to check and influence a person's behaviour.

Figure 4.4 shows the different degree of change to the business model using a general example in the automotive industry.

4.2 Business Architecture of the Mobility Industry for the autoMOBILE

Figure 3.5 shows an established business model in the automotive industry. Of course, changes to the model have fundamental effects on all of the company's business. Things become risky, however, if the brand identity changes, and regular customers see no value in the new promise of benefit. In this regard, the task of developing new models is very difficult, because the automotive industry has become very mature over several decades. The same applies to dealing with several business models if new models are competing with ones which have existed for a long time, or even throwing them into question entirely. However, new business models are always developing in the competitive market [3], and automotive companies are required to implement the first steps towards a mobility industry.

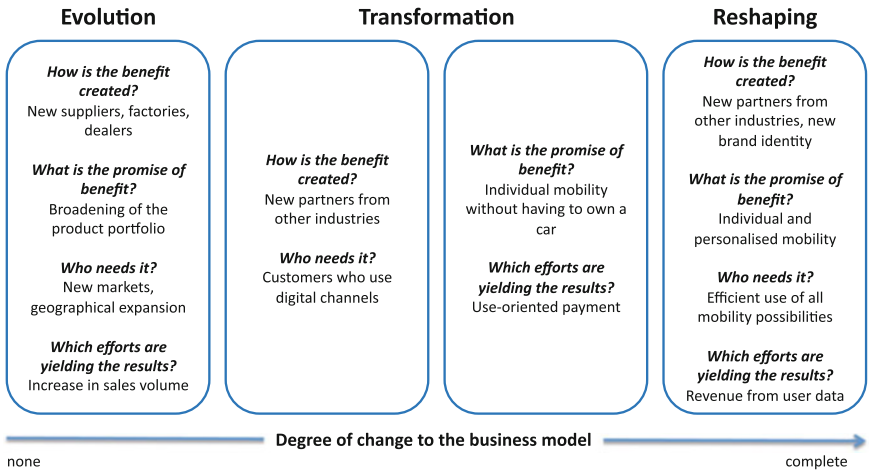

Fig. 4.4 In terms of the evolution of the existing business model in the automotive industry, the extent of the changes is only very minimal. Transformation allows established companies to develop new business models with a manageable level of risk. Creation, on the other hand, makes it necessary for there to be a change of strategy to a completely new entrepreneurial impact direction

4.2.1 Business Model of a Mobility Service Provider

Of course, automotive companies need to examine the business models of mobility service providers more precisely in order to be able to move away from the vehicle-centric model of thought when they develop towards the mobility industry. Mobility service providers build on two basic principles which distinguish them fundamentally from traditional automotive companies.

Collaborative consumption:	Goods for a specific purpose are used jointly.
Need orientation:	Clients' needs are fulfilled by services without any product loyalty or assets.

For example, a rental car company makes a car-sharing car available as part of its business model – which means it has already been adhering to the first principle of "collaborative consumption" for several years. By contrast, the driving service agencies Uber and myTaxi are not bound to assets or to a fleet of vehicles, and adhere to both principles. The route planner moovel is not even bound to transport itself. There are so many varieties of mobility services that vehicle manufacturers cannot concentrate on all of them – especially given the fact that there are also mobility services which have nothing to do with vehicles – such as travel agencies, for example.

We will concentrate on the "car-sharing" business model, because it is a vehicle-related service similar to a rental car, and is located right at the centre of the intersection between mobility services, where the transition between an owned

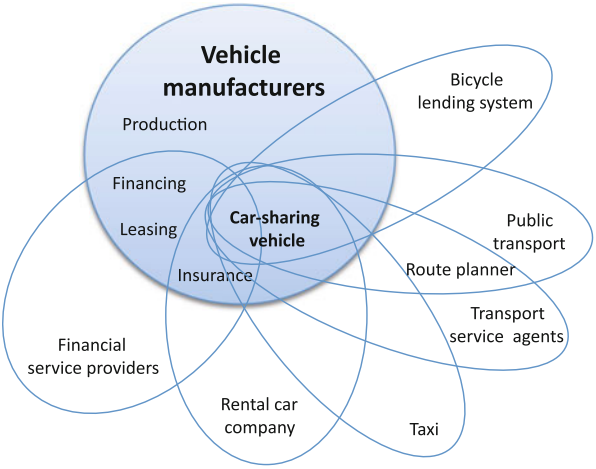

Fig. 4.5 Car-sharing vehicles are at the centre of the intersection between mobility services, at the transition between an owned AUTOmobile and a used autoMOBILE

AUTOmobile and a used autoMOBILE (see Fig. 4.5) is found. To be precise, there are three different variants:

1. *Station-dependent car-sharing vehicles* are often rented for a certain period of time – usually a few hours or days – in conglomerations or for journeys between cities. The vehicles are collected at defined parking spaces, where they are also left afterwards. The difference between this and a traditional rental car is that in this case, there is no need to conclude a contract for every rental. Some examples of this are Flinkster and car2go black.
2. *Station-independent car-sharing vehicles* are located in a defined area of use, and are paid for the driving time or distance they are used for. Users enjoy full flexibility in the sense that they can leave the vehicles in any free parking space as long as it is not outside the area of use. Some examples of this are car2go and DriveNow.
3. *Private car-sharing vehicles* are rented or rented out in a private capacity for defined periods of time. One example of this is Autonetzer.

But we should always keep in mind that also "car-sharing" is just a temporary business model which will further evolve in the next years.

The brand car2go, for example, is a completely new business model for Daimler. See Figs. 4.6 and 3.5. The way in which benefit is created is very different in each of the two business models. But even though this is a new business model, it still involves building a bridge to the existing core business – as part of which it is only Daimler vehicles which are used in the fleet. This creates a competitive advantage in comparison to other providers – who have to purchase vehicles on the open market. The model used by car2go is still at the beginning of its development, but with

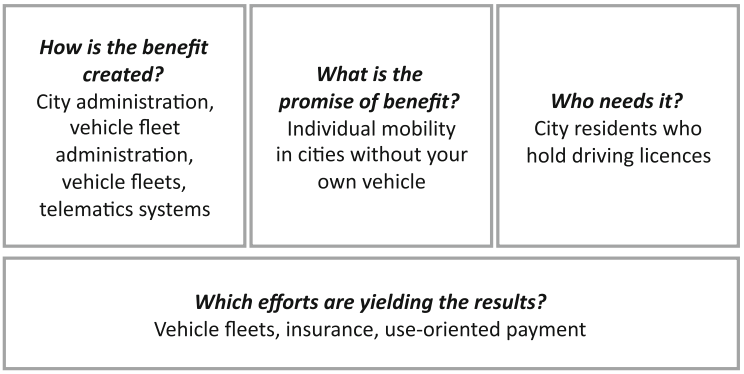

Fig. 4.6 Simplified business model of the brand car2go as a provider in the segment of station-independent car-sharing

moovel, it has already managed to establish its own independent, strategic business unit within Daimler. In this situation, the existing business model is not replaced as a result of the transformation – instead, it is complemented in a way which makes sense, and the company learns how to deal with several business models. Nonetheless, Daimler must make decisions on the organisational structure of the new business model – i.e. whether it will continue to be developed in a way which is integrated into the established core business, or separate from it.

The start-up moovel, however, does not consist of brands such as car2go alone, which were developed from Daimler's internal competences and resources. Other brands such as myTaxi and RideScout were acquired by moovel so that it could speed up the development of the business model on the international mobility service market.[25]

An important factor in the success of such transformations is the flexibility of the enterprise architecture at the level of the business architecture. This also means a change in the business competences.

4.2.2 Business Domains

The paradigm shift from the AUTOmobile to the autoMOBILE means that the business model is not the only thing to change. Via the implementation of the model, this change has direct effects on most business domains. According to the definition of different extents of changes to the business model (see Sect. 4.1.3), we will concentrate on transformation as regards the established automotive industry. Using this form of innovation, established large companies can, to a great extent, plan

[25] "moovel acquires mytaxi and RideScout" http://media.daimler.com/dcmedia/0-921-657772-49-1735230-1-0-1-0-0-0-0-0-0-1-0-0-0-0-0.html. Accessed: 19 December 2014.

their business success with manageable risks. The targeted, iterative development of existing business competences and resources makes it possible to build up new business areas in the area of spatial mobility which are outside of vehicle ownership, and which address other needs. The transformation is characterised by the fact that a connection to the existing core business remains intact – even if the development of new areas of growth is outside of this.

Our starting situation is made up of the business domains of the automotive industry, which we have put together in Fig. 3.7. Depending on the goals and strategic orientation of the mobility services, however, the transformed model of business domains may vary from one automotive company to another.

For the transformation of business competences, we use the two following basic principles:

1. Primary focus on building up digital competency
2. Modernisation of the three heavyweights in secondary focus

Behind the conclusions presented in this section and the next, there is an interactive process as part of which many levels must be taken into account simultaneously: The business domains, along with the respective business competences of the reference model shown in Fig. 3.44 with the corresponding characterisations which we summarised and discussed in the subsections of Sect. 3.6 along with aspects of digitalisation. We will not, however, go into more detail about the approach – instead, we will explain the results of a possible transformation.

We will begin this section by giving a rough outline of the positions of the new business domains (see Fig. 4.7), which come about as the result of the business model of the mobility industry being applied to the business domains of the automotive industry. In the next section, we will address the new or changed business competences of each of the domains.

Primary Focus on Building Up Digital Competency

The primary focus is on those business domains which orient themselves towards the market. Thanks to the possibilities provided by connectedness and digitalisation in particular, we design the two business domains with a primary focus on

1. “Sales and digital access” and
2. “Digital product integration and value added service”

and a secondary focus on the existing business domain of “financial service” within the framework of the prioritised basic principle.

Sales and Digital Access

The business domain of “sales and digital access” is derived from the original business domain of “sales and outbound logistics” (see Sect. 3.6.6). All business competences with a link to outbound logistics are shifted to physical production. This can be similar to the sale of a factory – with the difference, however, that this

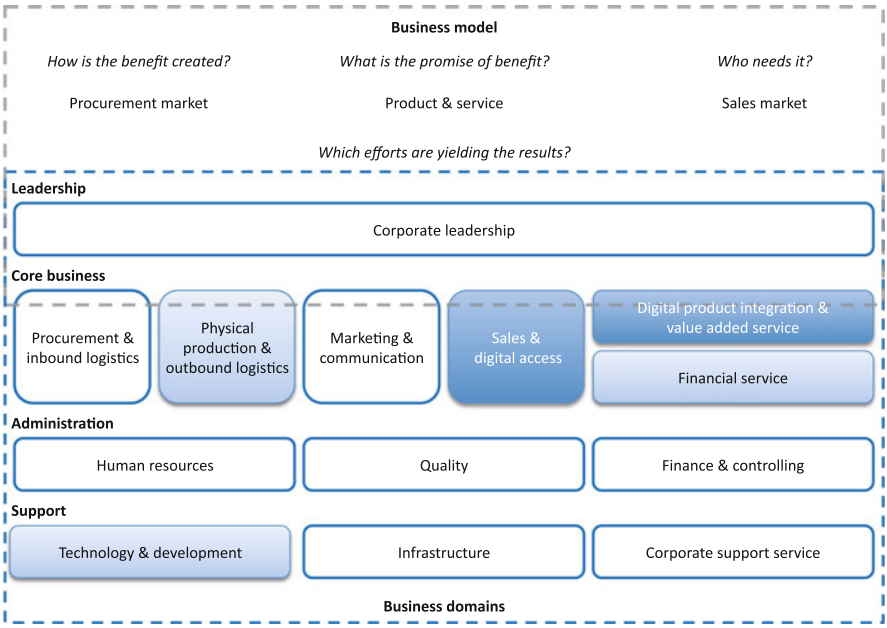

Fig. 4.7 Transition of the business model of a mobility industry to the business domains of the automotive industry, based on Fig. 3.7. The *dark blue* domains have a primary focus on transformation, while this is the secondary focus of those domains coloured *light blue*

is not where sales are managed, but where handover takes place either to private customers or to fleets for various mobility services.

In addition, there are models for individually tuned customer relations with stronger digital access. Thanks to modern technologies and the bringing together of several sales channels – such as the internet – direct sales take on a whole new meaning in this domain.

Some automotive companies such as Daimler are already implementing business domains such as these.[26]

Digital Product Integration and Value Added Service

The business domain of "digital product integration and value added service" is derived from the original business domain of "after-sales support" (see Sect. 3.6.8). Alongside the continuation and further improvement of business competences in order to support traditional customer service, mobility services are built up, and the crucial direct and control business competences from the domain "research and development" are taken on. The objective is to pool products and services. In doing

[26] "Daimler expands its digital customer service" http://www.computerwoche.de/a/daimler-baut-seinen-digitalen-kundenservice-aus,3066395. Accessed: 19 December 2014.

so, this business domain must develop the *digital copy* in such a way that it becomes a new type of production in addition to the three ones which are already established in terms of product manufacturing (see Fig. 2.2). Therefore, the final integration and product validation will occur after the sales of the vehicle and not anymore before as it is today.

Financial Service

Even if the name of the "financial service" business domain (see Sect. 3.6.7) has not changed, an increasing number of mobility ranges and usage/payment models are creating new demands on financing, insurance and payment systems.

Modernisation of the Three Heavyweights in Secondary Focus

The basic requirement for successfully building up new business competences in the long term in those core business domains which are oriented to the market, is to alter those business competences in the core business domain which focus on the procurement market. We refer to the three domains of

1. "Research and development",
2. "Procurement and inbound logistics" and
3. "Production"

as heavyweights, because the traditional vehicle manufacturers view them as their value creation. Depending on the company, the focuses and differentiations in the market vary in many ways, including in terms of these three business domains:

- Honda's focus on "research and development" seems to be particularly pronounced [22].
- In the case of Toyota, one gets the impression that purchases have a lot of influence. By shifting "research and development" to suppliers such as Denso, however, the cost focus of purchases is usually only on procurement. While BMW has a dominant focus on "procurement and inbound logistics" [21], it is structured in a different way to Toyota.
- The Toyota production system [17] enjoys a very good reputation, and is often copied due to its uniqueness in the "production" business domain [12].

Our secondary focus in this area is on the following two business domains:

1. "Physical production and outbound logistics" and
2. "Technology and development"

The business domain "procurement and inbound logistics" remains unchanged to begin with, as suppliers will continue to be central to a mobility industry. Cooperation models may be given new orientations – which does not tend to be something completely new. The situation can be different if a vehicle manufacturer in procurement does not have a global positioning, but it needs this to be part of a

mobility industry. At the end of the day, however, it is less about redesigning the whole domain, and more about changes on the level of business competences.

Physical Production and Outbound Logistics

The business domain of "physical production and outbound logistics" is derived from the original business domain of "production" (see Sect. 3.6.4). These are accompanied by business competences in the context of outbound logistics, engineering and production launches. The overall framework concentrates on creating a *minimalistic travel capsule*, for which, once again, the bill of materials of the AUTOmobile only concentrates on the fundamental parts of the three subsystems "drive system", "chassis" and "bodywork" (see Fig. 2.7). Build to order should be considered on top of build to stock and not instead of.

Technology and Development

What is certainly one of the most difficult changes to make is to shift the original core business domain of "research and development" (see Sect. 3.6.2) into the support domain of *technology and development*, and to get rid of some business competences. Essential business competences are shifted into the business domains of "digital product integration and value added service" and "physical production and outbound logistics".

Corporate Leadership

The transformation of the business model can also have effects on the seven remaining domains – which are, however, not so much in our focus. We will only look at the business domain of "corporate leadership" (see Sect. 3.6.1) in terms of the direct influence of the changed business model. In Fig. 3.12, we have summarised a few simplified challenges posed by corporate leadership to the business domains of the automotive industry. Creating the five business domains anew also changes this orientation, as is summarised in Fig. 4.8. Here it is also the case, however, that the analysis should take place in more detail in terms of company-specific leadership on the level of the business competences.

4.2.3 Business Competences

In Fig. 3.44, we have summarised a reference model of the business architecture using the business competences for the automotive industry as it is today. The implementation of the business model is in a state of interplay between the domains and their business competences, with some special characterisations. In this section, we will summarise those of the new or fundamentally changed business competences of the business domains which we focused on in Sect. 4.2.2, and discussed from several perspectives in each of the subsections of Sect. 3.6. In Fig. 4.9, we present the reference model of the business architecture for a possible mobility industry with core competences regarding the autoMOBILE.

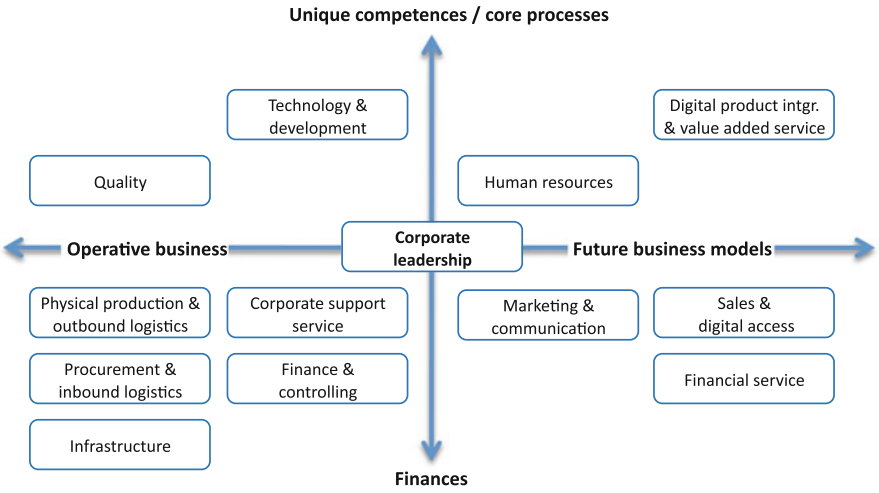

Fig. 4.8 Simplified representation of the business domains in terms of challenges faced by corporate leadership in a mobility industry

Sales and Digital Access

In the domain "sales and digital access", our primary focus is on two business competences:

1. The business competence "customer voice and contact" is a shift in and broadening of the business competence "customer voice" of the business domain "after-sales support". Not only does it deal with the technical demands of the vehicle to be operated – it also complements the business competences "corporate communication" and "marketing and communication" from the domain "corporate and brand identity", in order to ensure a long-term, direct and individual customer relationship. CRM systems taken on a central role here in terms of making customer experiences more targeted, and managing them in a more consistent way.
2. In the original business competence "order and distribution", the focus shifts more towards the individualisation of the commission, with the business competence "order and individualisation". In this context, the new competences of the business domain "digital product integration and value added service" should be used intensively.

and two business competences in secondary focus:

1. Neither the business competence "qualification, quote, contract"
2. nor "acceptance and documentation" deviates fundamentally from the task areas given up until now. Through direct sales, there are different processes, approaches to work and types of sales training which become necessary as a

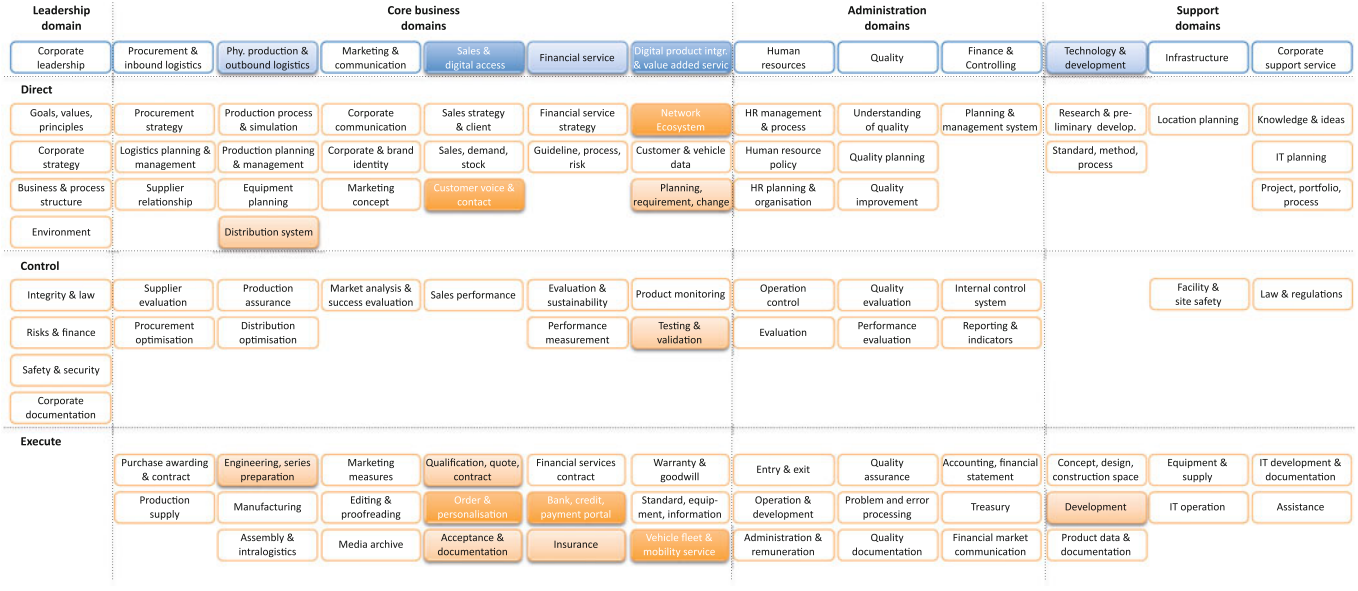

Fig. 4.9 Reference model of the business architecture for a possible mobility industry with core competences regarding the autoMOBILE. During the transformation, the *orange-coloured* business competences are in focus – the *darker ones* in primary focus, the *light ones* in secondary focus

result of the demand to individualise products, as shown by the fact that BMW has introduced the new role of "Product Geniuses" into its company strategy (see Sect. 3.1.1).

Digital Product Integration and Value Added Service

In the domain "digital product integration and value added service", our primary focus is on two business competences:

1. We are creating a new, execute business competence "vehicle fleet and mobility service" which builds up individual value added services in the broader context of mobility – the autoMOBILE – similar to what was described in Sect. 4.2.1.
2. The framework of the original direct business competence "connected vehicle" is broadened to include "network ecosystem" as shown in Fig. 3.36. A central theme is, nowadays, whether the telematics unit (see Sect. 2.5.2) must continue to remain part of the technical vehicle architecture. Even in the context of the emergency call system eCall, people always need rapid breakdown assistance – no matter how they are involved in traffic (inside or outside a vehicle). The vehicle data needed for emergencies, such as chassis number or drive system, does not necessarily have to be sent by the vehicles' integrated systems.

and two business competences in secondary focus:

1. The main focus of the original direct business competence "planning, requirement, change" from the domain "research and development" is shifted to this domain. It has the long-term task of transforming product development (see Sect. 2.2) into three main phases.
   (a) To reduce the original process to a minimalistic, roadworthy travel capsule, as part of which the AUTOmobile's bill of materials concentrates only on the main parts of the three subsystems "drive system", "chassis" and "bodywork" (see Fig. 2.7).
   (b) The subsystems "Interior/Equipment" and, to a certain extent, "Electrics/Electronics" are shifted to a second phase, *periphery*, and can, in accordance with traditional product manufacturing, be connected to the travel capsule's central unit, and replaced. It is an idea which has been developed from the BMW concept "LifeDrive Architecture",[27] in which the Drive and Life modules are separate from one another. Concepts such as Lego vehicles[28] are ideas which cannot yet be implemented. First implementations of 3D printers

[27] "BMW i : Concept" http://www.bmw.com/com/en/insights/corporation/bmwi/concept.html. Accessed: 19 December 2014.

[28] "Life-size Lego car runs on air" http://edition.cnn.com/videos/world/2013/12/29/nr-australia-lego-car.cnn. Accessed: 19 December 2014.

have been made in the automotive industry by Local Motors.[29] Soon, it will also be possible to produce personalised printed equipment components, or components for vintage vehicles. Increasingly, technology and electronics companies will drive their experiences with interfaces for the decoupling of peripheral devices in the automotive industry.

(c) The third and final phase mainly concentrates on the subsystem "Communication and Entertainment" and includes software, which must not necessarily be integrated into the first two phases. It forms a layer for virtualisation – which is referred to in IT as a "Software Defined Environment" [28]. An example which has already been implemented as part of such a virtualisation is the firmware of Tesla Motors.[30]

These three new phases form the basis for digital product integration, as we have presented in a summarised way in Fig. 4.10.

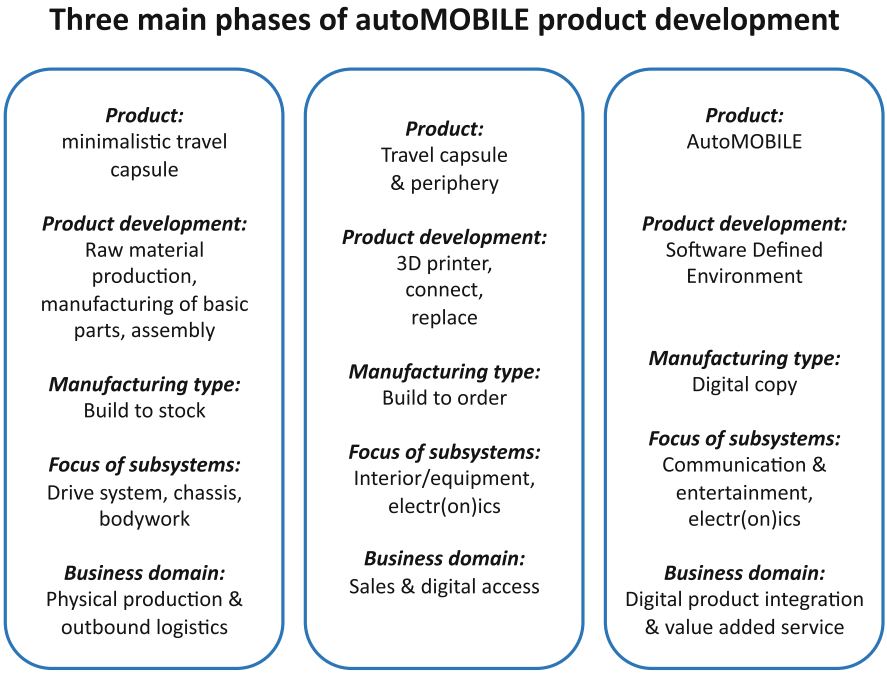

Fig. 4.10 Paradigm shift in the product development of the autoMOBILE in three main phases

[29] "Local Motors – 3d Printed Car" http://localmotors.com/3d-printed-car. Accessed: 19 December 2014.

[30] "A Silicon Valley Approach to Vehicle Software" http://my.teslamotors.com/roadster/technology/firmware. Accessed: 19 December 2014.

2. Due to the significant changes to product development, the control business competence "testing and validation" from the domain "research and development" must also be given new direction and shifted into this business domain.

Financial Service

In the domain "financial service", our primary focus is on one business competence:

1. While some automotive companies already have an execute "bank and credit" business competence, others have to build it up from scratch. Due to the increasing number of mobility ranges on offer, this business competence must be broadened to include "bank, credit, payment portal" in order to make it possible for different individual and public services to be billed for conveniently using a single payment system. The financial services of a vehicle manufacturer usually carry out large-scale transactions when promoting product sales. In the use-oriented mobility industry, on the other hand, there are many small sums of money which need to be dealt with in a different commercial way in order to remain cost-efficient in terms of a worldwide transaction system.

and one business competence in secondary focus:

1. In the executive business competence of "insurance", in addition to traditional vehicle insurance, both new insurance models for own fleets and driver-related insurance gain more relevance for the mobility industry.

Physical Production and Outbound Logistics

In the domain "physical production and outbound logistics", our secondary focus is on two business competences:

1. The direct business competence "distribution system" from the domain "sales and outbound logistics" is more closely linked to the production site. This is less about factory outlets than it is about having a stronger focus on build to stock production, at least for the minimalistic travel capsule which is, in general, only manufactured using physical production.
2. Vehicle engineering of the business competence "development and engineering" from the domain "research and development" is brought together with the execute business competence "series preparation" into one competence: "engineering, series preparation".

Technology and Development

In addition to the outsourcing of the business competences "planning, requirement, change" and "testing and validation", in the domain of "technology and development" our primary focus is on one business competence:

1. The original execute business competence of "development and engineering" is reduced to "development" alone.

It can also make perfect sense to shift the business competences "knowledge and ideas" or "project, portfolio, process" from the domain "corporate support service" to this business domain. For the moment, however, we have only looked at reducing the business competences in this domain.

4.3 Outlook

Where will digitalisation and connectedness take us in terms of spatial mobility?

The automotive industry is currently facing the prospect of its greatest transformation in the history of the AUTOmobile, and companies appear to have no idea of how to orient themselves in regard to this. The enterprise architecture described in this book was designed in such a way that a mobility industry cannot develop in isolation from the automotive industry, if vehicle manufacturers give their business competences new direction.

The fundamental theme that we have gone into less detail about is security – in the sense of security from attack. We only touched on it as a business competence from the domain "corporate leadership" (see Sect. 3.6.1). It is important to be aware that in the digital world, there are no thick, high walls. At the end of the day, the only thing of importance will be how we behave socially in a large, connected family – and how we act towards black sheep.

The main problem is due to the fact that digitalisation is based on discrete mathematics. It simply has not been proven whether one-way mathematical functions exist – functions which can only be reversed with a lot of effort, or are not reversible at all. In practice, multiplication is a very widespread procedure in the field of digital security, because the decomposition of numbers can still involve a great amount of effort when using today's technologies [6]. There is bound to be an inverse function – even if the Riemann Hypothesis of 1859 still has not been solved – after all, it has not been disproved either [30].

A broader discussion of this factor would be far outside the scope of this book. Further developments and thoughts are elaborated on in the blog

http://think-automobility.org

The designing of the mobility industry will remain exciting and interesting for some time to come.

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