Chapter 6

Germany BMW's Sustainability Strategy of Evolution and Revolution towards a Circular Economy

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Chapter 6

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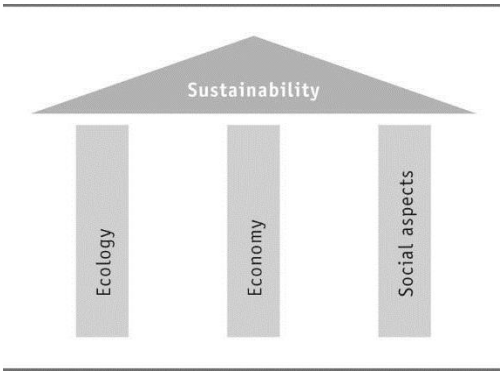
1. Introduction

When talking about sustainability in the academic context of Germany, at least three dimensions of the so-called 'triple bottom line' are considered: economic, social, and ecological.

Figure 6.1. Three-Pillar Model of Sustainability



Source: Ernst and Sailer (2015).

This is in line with internationally accepted sustainability and corporate social responsibility reporting principles such as the Global Reporting Initiative and the Dow Jones Sustainability Index. This chapter will emphasise the circular aspects of the ecological pillar. Nonetheless, the interrelations to other dimensions, if useful, will be briefly explained.

Within the ecological dimension, three basic strategies can be distinguished: (i) Efficiency; (ii) Consistency, also known under the terms of 'Cradle to Cradle' (Braungart, McDonough, 2002); and (iii) Sufficiency (also through Share Economy, e.g. car sharing).

BMW was chosen as example partly due to its comprehensive approach to sustainability and partly due to its role as one of the leading companies in the passenger vehicle industry and with regard to electro-mobility. The holistic approach is reflected in BMW's description of its sustainability management approach:

> For us (BMW), sustainable operations constitute a long-term business case: sustainability means making a lasting positive contribution to the company's economic success. However, we don't measure success by financial indicators alone but rather in terms of the solid integration of the company into society. Taking social and environmental responsibility for all we do is an integral part of our corporate image. We are convinced that the lasting economic success of any enterprise these days is based increasingly on acting responsibly and ensuring social acceptance. We also believe that the manufacturer with the most efficient and resource-friendly production processes will be the future industry leader, offering its customers state-of-the-art solutions for sustainable individual mobility (BMW, 2014).

BMW is also an example for the transition process of the German premium car industry towards sustainability, especially ecological sustainability. Other premium car companies are in a similar transformation mode although following different strategies to reach the targets defined by the market, policymakers, and society.

2. Case Context: Background Information About BMW and the German Premium Car Industry

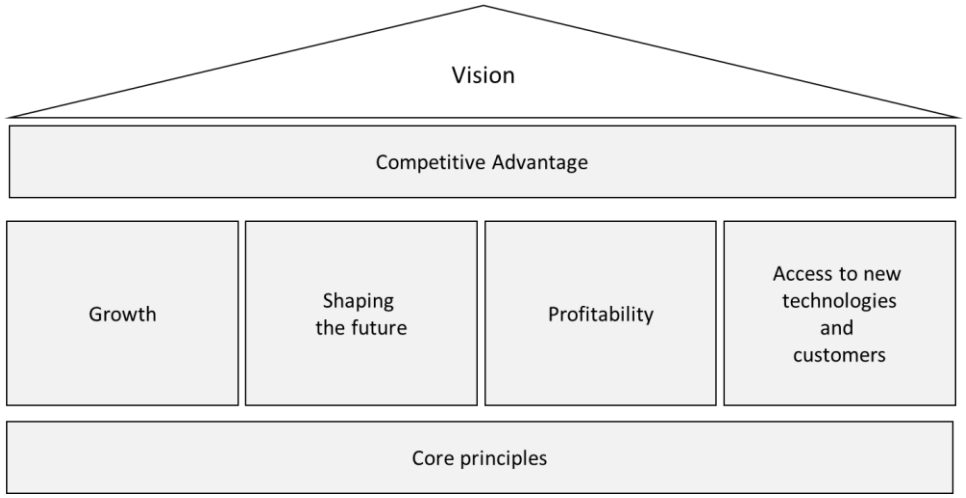
A total of 73 million cars were sold worldwide in 2014. About six percent of those were considered premium cars from the three leading German car makers: BMW, Audi, and Mercedes-Benz. Among the three companies, BMW is considered to be the market leader as proven by various indicators such as total sales, profitability, or employees (Automobilwoche, 2015a). In 2012, BMW was leading the automotive industry with an estimated brand value of US$24 billion (BrandZ, Millward Brown, 2012).

2.1. Motivation of the Firm for a Circular Strategy

BMW's sustainability strategy, passed in 2009, was derived from its previously created and agreed strategy programme called 'Strategy Number ONE' and is its overarching strategy for all its corporate divisions worldwide. BMW's main aim is to establish sustainability along the

entire value chain and in all its basic processes, and thus create added value for the company, the environment, and society.

Figure 6.2. BMW's Strategy Number ONE



Source: Author's illustration based on BMW.

Sustainability has been the BMW Group's strategic corporate objective since 2009. Each of its major projects is, therefore, measurable in terms of sustainability. This ensures that, in addition to economic factors, environmental and social aspects are considered in the decision-making process. By taking this into account, BMW is convinced that the value of a company is not measured solely by direct financial indicators but also by its non-financial performance.

2.2. Current Concerns, Issues, and Potential Opportunities

The automotive industry is transforming traditional combustion engine concepts into new drive concepts that promise lower emissions and, therefore, reductions of emissions that cause climate change and global warming.

To reach the goals of CO_2-emissions reductions agreed in cross-national agreements such as the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), governments have stated goals towards carbon-neutral mobility. The German government, for its part, has been pushing for e-mobility by stating, through Germany's Chancellor Angela Merkel, a clear objective: 1 million e-drive cars on the road in Germany by 2020 and 6 million e-drive cars by 2030 (Automotive IT, 2011). Besides the initiative to make the German car industry a 'leading supplier' in that technology (*Leitanbieter*), the intention is

also to make Germany a 'leading market' (*Leitmarkt*). So far, government incentives are rather limited to be able to support this goal with a policy. Thus, additional measures are being discussed between policymakers and industry associations.

Furthermore, consumers are still hesitant to buy e-cars, partly due to higher cost and current limitations (e.g. charging duration, range limitations, availability of charging stations) and to limited long-term experience with that technology (e.g. battery lifetime).

But as can be seen in the various efforts of the industry players, different technological and commercial approaches for cleaner mobility options are being tested for market success. Besides e-mobility are approaches on fuel cells and biogas and combined approaches using hybrid technology, range extenders, etc.

Some industry observers are also concerned about the consequences to the German car industry of the transition towards e-mobility as the technological know-how needed is much different from that of traditional combustion engine technology. The demand for traditional expertise in mechanical engineering and metal works is expected to be replaced by a need for know-how in electronics, battery technology, and lightweight composite technology materials.

Another key driver for the car industry strategy are the regulations of the European Union (EU) on CO_2 and NOx emissions for diesel engines. Here, the current testing methods are being discussed due to their irrelevance to real driving conditions. A new EU proposal is being developed to redefine the testing to measure the so called 'real driving emissions' (Becker and Vieweg, 2015; Mock, 2014).

The EU regulations measure the average CO_2 emissions of a car company and require car manufacturers to adjust their product offerings and product mix. In China, emission problems in major cities have led to laws making e-mobility mandatory. Examples can already be seen in Beijing, Tianjin, and other big cities where small motorcycles run on electricity. The American and Norwegian governments are supporting e-mobility with incentives. This has led to more than 280,000 electric or hybrid cars registered in the US, mainly in California (Automobilwoche, 2015b).

Beyond the environmental requirements are the changes in society. An issue, as reported, is the increasingly reduced interest of younger generations in automobile products, especially in urban regions. These changes and other aspects of sustainability have lead BMW to anticipate future mobility needs with future mobility projects such as the BMW i360 degrees ELECTRIC, the car-sharing platform DriveNow, locating and paying at ChargeNow charging points, parking at ParkNow and ParkatmyHouse, navigating with the smartphone app MyCityWay, and Life360 to bring together family members across the city (BMW, 2014). A variety of research projects are looking into various issues of future mobility including Future City Planning, long-distance commuters, wind energy, mobility cultures in World's Megacities, as well as the contribution of information and communication technologies (BMW, 2014).

To identify issues that may represent risks and opportunities, BMW has established a so-called 'materiality process' to find out what those issues mean for the different stakeholders and, internally, for BMW. The results of the materiality analysis, inserted into a two-dimensional materiality matrix with the two dimensions 'Importance for BMW Group' and 'Importance for Stakeholders', are the input for the further development of the sustainability strategy (BMW, 2014).

BMW is responding to those challenges with a strategy of parallel evolution and revolution, which means that BMW is improving efficiency and emissions of combustion engines (evolution) and introducing a revolutionary product line of e-cars (i-series i3 and i8).

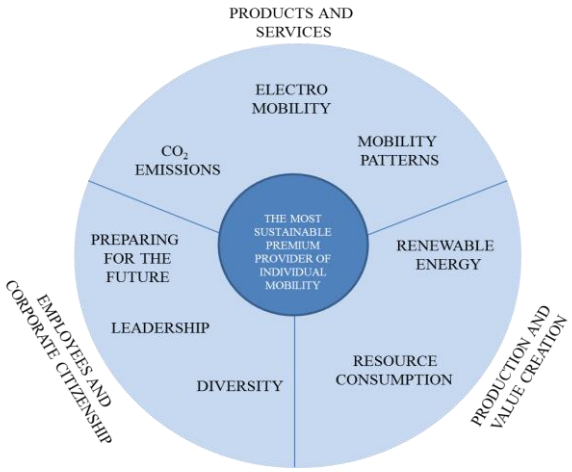
3. Description of Actual Steps and Strategies Adopted

3.1. BMW's Sustainability Strategy

For BMW, leadership in premium mobility also means excellence in sustainability issues:

> Our understanding of the term 'premium' is now being taken to a new level with the BMW i brand. Inspired through and through by the desire for even greater sustainability, the BMW i epitomizes the vehicle of the future – with its electric drivetrain, revolutionary lightweight construction, exceptional design and an entirely newly designed range of mobility services (BMW, 2015a).

Figure 6.3. BMW's Sustainability Goals and Strategy



Source: Author's illustration based on BMW.

3.2. Product Responsibility – 'Evolution and Revolution'

In response to the changes in the marketplace, BMW is pursuing a proactive strategy. Rather than react to a changing environment, the company intends to pioneer and drive the transformation process. BMW describes this proactive strategy as a combination of evolution and revolution. Evolution refers to the further development of the combustion engine technology, the construction of lightweight cars, hybrid drivetrains, and increased resource efficiency in the production processes. Revolution refers to carbon-free mobility with new types of drivetrains and ambitious targets in the area of new materials, resource-efficient production, and mobility service innovations (BMW, 2014).

The revolutionary part of BMW's sustainability strategy materialises primarily with the launch of the BMW i family, following its intention of positioning BMW as an innovation leader in the area of e-mobility to take the integration of sustainability along the value chain to a new level. The company's differentiation is based on the claim of being the only premium manufacturer that offers, since 2013, purpose-built vehicles for electric drivetrains using a carbon body technology that significantly reduces vehicle weight. Beyond those technological differences, a service concept called 'BMW i services' is creating sustainable mobility on the premium level (BMW, 2014).

The BMW i8 is supposed to combine the driving performance of a sports car with the fuel consumption of a compact-class model. The plug-in hybrid system developed for the BMW i8 is designed to meet the highest specifications in terms of driving dynamics, efficiency, practical usefulness, and quality, with the target to underline the BMW Group's pursuit for technological leadership in the field of drive system development. In the long term, the BMW Group plans to transfer the eDrive technology to its other core brand models (BMW, 2015a).

In line with BMW's holistic understanding of sustainability, the electricity for the assembly of the BMW i3 and BMW i8 at their Leipzig factory is coming completely from renewable resources (BMW, 2014).

The evolutionary part of the sustainability strategy is what the company is branding as 'efficient dynamics'. This means that the organisation is working continually to optimise the range of combustion engines featuring the so-called TwinPower turbo technology. The efficient dynamics family of engines, comprising 3-, 4-, and 6-cylinder power units, reflects the output of a systematic development process. Higher aluminium content plus the use of the lighter magnesium has enabled BMW to reduce the average weight of its latest range of engines. The first of a new generation of engines is a 1.5-litre, 3-cylinder petrol engine which found its first release in the BMW i8. BMW also presented the first 4-cylinder versions of the new engine family in 2014.

The possible integration of a plug-in hybrid system is part of BMW's thinking when new BMW and MINI models are being developed, thus ensuring, among other things, that future model variants equipped with hybrid drive technology will be just as suitable for everyday use as

their standard counterparts. The BMW Group took a further step forward in the field of power train electrification with its presentation in 2014 of the newly developed range of hybrid drive systems intended for high-performance electric drives based on Power eDrive technology. In future-generation plug-in hybrid vehicles, around two-thirds of the drive system's output should come from the Power eDrive electric system and around one-third from the so-called TwinPower turbo technology combustion engine. Furthermore, the BMW Group is developing battery-powered drive systems (as in the BMW i3) and plug-in hybrids, as well as fuel-cell electric technology and high-voltage electrified systems (the so-called Power eDrive). The BMW Group intends to continue to be able to react flexibly to the needs of customers and new legislative regulations by using its wide range of drive systems (BMW, 2015b).

To summarise and relate this to the three basic strategies towards ecological sustainability through a circular economy, those improvements in the evolutionary part of the strategy can be categorised mainly as an efficiency strategy. The revolutionary part of the strategy of e-mobility can also be related to a consistency strategy, especially when using electricity from renewable resources. This is implemented by an innovative materials concept.

3.2.1. Lightweight construction

Lightweight construction is an essential component of the BMW Group's efficient dynamics strategy and embedded in its basic understanding of modern manufacturing. The consistent use of lightweight materials in vehicle design is particularly important with electrically powered cars, as not only the battery capacity but also the total weight of the vehicle restrict their range. To compensate for the added weight of the electrical components, the BMW Group has developed a so-called LifeDrive concept for the BMW i series vehicles.

In this context, the BMW Group has achieved an innovative combination comprising an aluminium chassis and a carbon-fibre-reinforced-plastic (CFRP) passenger compartment. By doing so, the material used helps reduce total vehicle weight, improves its point of gravity, and increases the stability of the car's body. The BMW Group is currently working on further possible applications, such as hybrid wheel rims made of a mixture of aluminium and CFRP.

After more than 10 years of research work and continual optimisation of the processes, materials, systems, and tools involved, the BMW Group is claiming to currently be the only automotive manufacturer with the required know-how to utilise carbon-fibre-reinforced-plastic on a large-scale production basis (BMW, 2015a). This approach to alternative drive can also be summarised under the term 'purpose-build approach', whereas other car manufacturers follow a 'conversion approach' by replacing the combustion engine with an electric drive (BMW, 2014).

3.2.2. BMW i 360°ELECTRIC for charging

Another important aspect for the successful conversion towards e-mobility is the charging infrastructure. With BMW i 360°ELECTRIC, BMW currently offers a package of products and services for purely battery-powered and plug-in hybrid vehicles in 38 countries worldwide.

The package is based on four features: comfortable, rapid, emissions-free charging at home; simple comprehensive access to public charging stations; flexible mobility for long-distance journeys; and an assistance service for maintenance and repairs (BMW, 2015b).

BMW offers two types of products for charging at home. In addition to the Wallbox Pure for simple, safe charging, the Wallbox Pro has been available since 2014 for faster charging. Furthermore, BMW is offering a service contract for electric power from renewable energies (PV, wind power, water power, biomass) provided by the energy partner company Naturstrom in Germany (BMW, 2015b).

3.2.3. Premium services for individual mobility

Beyond its innovative electric and hybrid cars, BMW i also stands for sustainable mobility concepts. The aim of the mobility services is to promote urban mobility, irrespective of the means of transport used. Some examples of those services will be described in subsequent paragraphs.

MINI and the rental car company Sixt enable users to rent BMW and MINI vehicles according to their needs. Through an app, website, or directly on the road, users can find, book, and park cars again in another part of the city. BMW's car-sharing service DriveNow is currently available in Munich, Berlin, Düsseldorf, Hamburg, Cologne, San Francisco, Vienna, and London. By the end of 2014, the fleet was consisted of about 2,800 cars and over 390,000 customers had subscribed to the car-sharing service. Under the brand name AlphaCity, BMW also offers a car-sharing scheme for businesses (BMW, 2015a).

ParkNow is an app- and web-based service that helps solve parking problems for users by having available parking spaces in partner car parks that can be booked online and making it easier to find roadside parking spots (BMW, 2015a).

ChargeNow is a BMW i mobility service that simplifies finding and using public charging stations run by various suppliers belonging to an international network. In 2014, many BMW i customers opted for this service. ChargeNow currently has over 24,000 charging points in 19 markets (BMW, 2015a).

To ensure optimum conditions for the use and promotion of innovative mobility services, BMW i Ventures was founded in 2011. Based in New York, BMW i Ventures facilitates access to new technologies and opens up new customer groups, thereby reinforcing the strategic approach adopted by BMW i. Life360, MyCityWay, JustPark, ChargePoint, and ChargeMaster are examples of BMW i Ventures' strategic investments (BMW, 2015a).

Some of the above-mentioned service concepts can be referred to the category of reaching sustainability by a sufficiency strategy, which means, in the terminology of circular economy, to 'reduce consumption of physical materials'. This is especially valid when talking about the car-sharing concepts of DriveNow.

3.3. Resource Efficiency and Recycling Management

Intelligent design and the use of secondary and renewable raw materials enable the company to reduce the consumption of valuable resources. By optimising recycling structures, the car producer is preparing for the future. BMW earned recycling experience with the German and European markets in the early 1990s and its recycling system is gradually being rolled out internationally. In 2013, this was established in 30 countries (BMW, 2014).

Legally required recycling rates for end-of-life vehicles, components, and materials with a quota of 85 percent for reuse and recycling and 95 percent for overall recovery by 2015 were already fulfilled by BMW in 2008 (BMW, 2014).

The secondary use of raw materials is another aspect of a circular economy. BMW's recyclates quota of thermoplastic materials increased in some products, from 15 percent in 2011 to 20 percent in 2013. With the new lightweight carbon-fibre-reinforced plastics, BMW is facing new challenges in the use of resources. Pure fibre material from manufacturing waste can be reused directly, whereas plastic-reinforced carbon fibres have to go through a separation process like pyrolysis and can then be processed further (BMW, 2014).

3.4. Group-Wide Environmental Protection

BMW aims to be the most resource-efficient premium provider of individual mobility, a goal being approached by a comprehensive, group-wide environmental management. BMW tracks and monitors relevant environmental indicators and its major investment decisions are also based on environmental considerations (BMW, 2014).

Environmental protection started in the early 1970s and BMW's environmental guidelines were established in 1993 based on the ICC Charta for Sustainable Development and Agenda 21. BMW's manufacturing processes are designed for minimum resource consumption and environmental impact. The International Declaration on Cleaner Production of the UN Environmental Programme was signed in 2001. BMW is aiming to contribute towards combating climate change by limiting greenhouse gas (GHG) emissions (mainly CO_2 emissions) through the manufacture of efficient vehicles, implementation of effective production processes, use of renewable energy sources, and selection of production locations (BMW, 2014).

In 2007, BMW defined a goal for 2006–2012 of reducing the consumption of resources and emissions per vehicle by an average of 30 percent. This was over-achieved with a reduction of 35.7 percent using the parameters of energy, water, process wastewater, waste for disposal, and solvent emissions. The new target for 2020 set by BMW is the reduced consumption per vehicle by 45 percent compared to 2006 (BMW, 2014).

Key performance indicators for 2013 were energy consumption of 2.36 MWh (2012: 2.41 MWh) per vehicle produced, waste for disposal per vehicle of 5.73 kg (down from 6.47 kg), water consumption of 2.18 cubic metres (down from 2.22 cubic metres) per vehicle produced.

Share of renewable energy increased from 36 percent to 48 percent as percentage of total power produced (BMW, 2014).

To improve energy efficiency, five strategic areas of action have been identified: (i) integrated energy management system; (ii) continuous improvement of ongoing operations; (iii) planning, implementation of energy-efficient properties, plants, and technologies; (iv) implementation of renewable energy projects; and (v) raising awareness, training, and motivating managers and employees on energy and energy efficiency (BMW, 2014).

The total CO_2 emissions were reduced from 0.94 tonne per vehicle produced in 2009 to 0.68 tonne per vehicle produced in 2013. Compared to the base year of 2006, BMW reached a reduction of 35.2 percent in 2013 (BMW, 2014).

Also, logistics is managed in a way to keep the environmental impact as low as possible. This is reached by expanding the use of low-carbon modes of transportation such as rail shipping. The share of vehicles shipped by rail was increased from 47 percent in 2009 to 60.7 percent in 2013 (BMW, 2014).

When BMW recycles materials or waste, the company is following the five-step hierarchical model defined by the EU: prevention, reuse, recycle, recovery, and disposal.

The action by the company resulted in a 69.7 percent waste reduction in 2013, compared to 2006 (BMW, 2014).

Other important environmental considerations at BMW are water as a scarce resource, emissions of volatile organic compounds (VOC), and biodiversity. Water consumption was reduced by 33.1 percent compared to the base year 2006. The target until 2020 is 45 percent reduction in comparison to 2006. In 2013, VOC emissions were reduced by 36.7 percent and for 2020, the target is 45 percent reduction (BMW, 2014).

3.5. Supplier Management

BMW's global supply chain network plays an important role in the success of the group's contribution to value creation, quality, and innovation to reach the company's sustainability goals. The company management focuses on managing and minimising risk as well as utilising opportunities and leveraging potential. Sustainability is also improved in the supplier network by providing sustainability trainings for purchasing managers. Another contributor to sustainability is related to internationalisation of sourcing to increase local sourcing (BMW, 2014).

To attain the sustainability goals, other important areas are to declare what principles and standards are mandatory to partners in the industry as well as the engagement of the company in industry initiatives and networks (BMW, 2014).

A really difficult issue is the management of the sourcing of raw materials. With today's multi-layered global and dynamic supply chains with their intermediate trade and processing stages and commodity trading on stock exchange, the tracing of materials from the source to the finished end product is a very complex endeavour. Establishing and pursuing sustainability standards in raw material production are therefore a challenge (BMW, 2014).

BMW's approach to that issue is to focus on selected, relevant, and critical supply chains and raw materials. Those supply chains are assessed and analysed to identify the need for action and, together with suppliers, measures are taken. BMW is participating in cross-industry initiatives such as the Aluminium Stewardship Initiative (ASI). Aluminium plays an important role in lightweight construction and BMW was the first car maker to join this initiative. ASI is the first comprehensive initiative for creating sustainability standards for the entire value chain of a metallic resource (BMW, 2014).

3.6. Sustainability Over the Whole Vehicle Life Cycle

BMW applies a comprehensive accounting method to assess the environmental, economic, and social impact of products across the entire life cycle. The method complements BMW's Life Cycle Assessment System according to ISO 14040/44. To improve the environmental impact of next-generation products, life cycle engineering is applied (BMW, 2014).

3.7. Goals or Outcomes Expected

As also stated by *Automobilwoche* (2015a), the magazine for car industry insiders, the main challenge for premium car manufacturers is the environmental impact. Managing this challenge includes investing in alternative drives as well as offering small cars besides the rather heavy and large cars.

BMW has defined its long-term sustainability goal to be 'the most successful and sustainable premium provider of individual mobility'. This overall goal is broken down into three subcategories: (i) products and services (CO_2 emissions, electromobility and mobility patterns); (ii) production and value creation (renewable energy and resource consumption); and (iii) employees and corporate citizenship (diversity, leadership, and preparing for the future) (BMW, 2014).

3.8. Key Stakeholders Involved and Perspectives of Various Actors

When looking at its customer base and positioning of the brand in the market, BMW has been famous for the claim *Freude am Fahren*, translated into English as 'Sheer Driving Pleasure' (US, South Africa) and 'Ultimate Driving Machine' (the UK, Australia), signifying a high affinity to sporty driving (BMW website, 2015). For traditional BMW customers, the replacement of large-volume 6- and 8- cylinder combustion engines by downsized 3- and 4-cylinder engines or even by a nearly noiseless electric drive was and is considered a major challenge, especially when taking into account the pricing premium on BMW automobiles compared to standard cars.

BMW's shareholders are classified into two major groups: the larger Quandt family who has a total share of 47 percent of all shares and who has held this investment since 1960, and the general public holding broadly distributed and traded shares. This means the BMW management is strongly influenced by a family with an unusual long-term perspective, which can be also described as the pursuit of economic sustainability. This is even more unusual, as Susanne Klatten, as part of the Quandt family (27 percent), together with BMW (18 percent), has also a major share in the composite material supplier SGL Automotive Carbon Fibres (*Automobilwoche,* 2015c).

Regarding suppliers, the case of SGL is especially interesting. To ensure the availability of innovative composite materials, BMW and the Quandt family have invested in SGL Carbon. This investment has gone through non-profitable phases and is still proving to be a major challenge in reaching economic sustainability (*Automobilwoche,* 2015c). This can be seen as an example of a trade-off between BMW's objective of profitability and the need for a reliable and performing supplier of innovative lightweight materials. This continues to be an implementation challenge, especially since the demand and production volumes are still limited to rather smaller figures.

The same applies to the other end of the vertical supply chain, where BMW has decided to work with selected distribution partners for the sales of the new i series and to pursue an innovative online distribution concept in some countries such as Japan. This trend has to be seen in the context of gaining access to new target groups who might not be attracted by the rather traditional retail concept of a car dealer. One success indicator is the claim that 75 percent of current BMW i3 customers had never previously driven a BMW (Wortmann, 2015).

BMW can be described as an attractive employer (it received various awards in 2013 like being fifth on the list of Universum World's most admired employers, being first in the automotive category) (BMW, 2014). The group-wide employee survey in 2013 indicated an overall satisfaction rate of 89 percent (BMW, 2014). The success of the company is also reflected in the additional hiring of employees, which led to increased employment from 105,000 in 2005 to 116,000 in 2014 (after a 10-year low of 95,000 in 2010).

Government as a key stakeholder has to be distinguished by country or region as policies and requirements differ in Europe, the United States (US), and Asian countries. This refers to varying incentives for electric cars and mandatory emissions standards for fleets. Efforts for coordinated regulations by region (within EU, the North American Free Trade Agreement [NAFTA] or Association of Southeast Asian Nations [ASEAN]) could be beneficial to successfully create a company's sustainability strategy.

4. Outcomes and Impacts

4.1. Accomplishments and Changes as Outcomes

In looking at the outcomes of BMW's sustainability strategy from the perspective of an independent third party, the data of the industry-independent International Council on Clean Transportation (ICCT) will be used. CO_2 emissions in the EU are reported based on the 2014 edition of *European Vehicle Market Statistics,* a statistical portrait of the passenger car, light commercial, and heavy-duty vehicle fleet in the EU from 2001 to 2013. For this region, 2013 was the first year in which the average CO_2 emissions from newly registered passenger cars fell below 130 g/km, the EU target for 2015 (Mock, 2014).

Within the European context, BMW, Mercedes Benz, and Audi are some of the brands with the highest CO_2 emissions in 2007, mainly due to vehicle weight and size, engine power, and engine displacement of the car fleet (Mock, 2014). Whereas the average engine power is 89 kW for all car brands in the EU member states, BMW is producing cars with an average engine power of 135 kW, higher than Mercedes (126 kW) and Audi (121 kW). Also, its engine displacement of 2,130 cm^3 is way above the average of all other brands (1,616 cm^3) (Mock, 2014).

Improved combustion processes and turbocharging allow manufacturers to extract more power from smaller engines. In the case of BMW, this has led to a decrease of engine displacement of 11 percent from 2,368 cm^3 in 2007 to 2,130 cm^3 in 2013, whereas the industry average decreased only 7 percent from 1,729 cm^3 to 1,616 cm^3 (Mock, 2014).

The EU average CO_2 emissions (also equivalent to the improvements of fuel efficiency) were reduced from 159 g/km to 127 g/km in 2007–2013, a reduction of 20 percent. The CO_2 emissions of the BMW car fleet went down from 176 g/km in 2007 to 136 g/km in 2013, a reduction of 23 percent. However, the reductions of its direct competitors, Mercedes Benz and Audi, are even bigger. Mercedes managed a 26-percent reduction from 189 to 139 g/km. Audi's fleet emissions were reduced from 184 to 135 g/km in the same period, a 27-percent reduction (Mock, 2014).

There are many possible interpretations for the reasons behind those reductions (composition of supply and demand by product categories, mix of engine technologies, etc.). As these data were results from the past, the reductions were related to the evolutionary strategy of efficient dynamics and not yet related to the revolutionary part of the strategy of electric mobility.

In 2014, the volume of carbon emissions produced by BMW's vehicle fleet sold in Europe decreased slightly to 130 gs CO_2/km (2013: 133 g CO_2/km; – 2.3 percent). The scale of the decrease in fleet emissions in 2014 was therefore not as pronounced as originally forecast, mainly reflecting the impact of a higher-value model mix on the one hand and the later-than-planned availability of the new MINI on the other (BMW, 2015a).

Another outcome from the recent introduction of the i series is that BMW became the market leader in e-mobility in Germany with 2,231 units of i3 sold in 2014. Worldwide, BMW ranks third in e-mobility sales after Tesla and Nissan Leaf with 16,000 units of i3 and 1,741 units of the Plug-in-hybrid sports car i8 sold. A key market in 2014 was the US with 6,000 units of i3 sold. In Norway (a country with less than 5 million inhabitants), BMW sold about the same amount of BMW i3 as in Germany due to tax incentives (no value-added tax) and cost-free charging infrastructure.

More holistically, a different way of looking at the outcomes beyond CO_2 emissions are sustainability awards. BMW has been awarded by various sustainability indices such as the Dow Jones Sustainability Index, the Carbon Disclosure Project, and the SAM Sustainability Award. The BMW Group achieved a strong result in the Global 500 Ranking Carbon Disclosure Project published in September 2013. With the maximum number of points possible, the company is described as an industry leader and listed on the Carbon Disclosure Leadership Index.

4.2. Concerns and Challenges that Still Remain

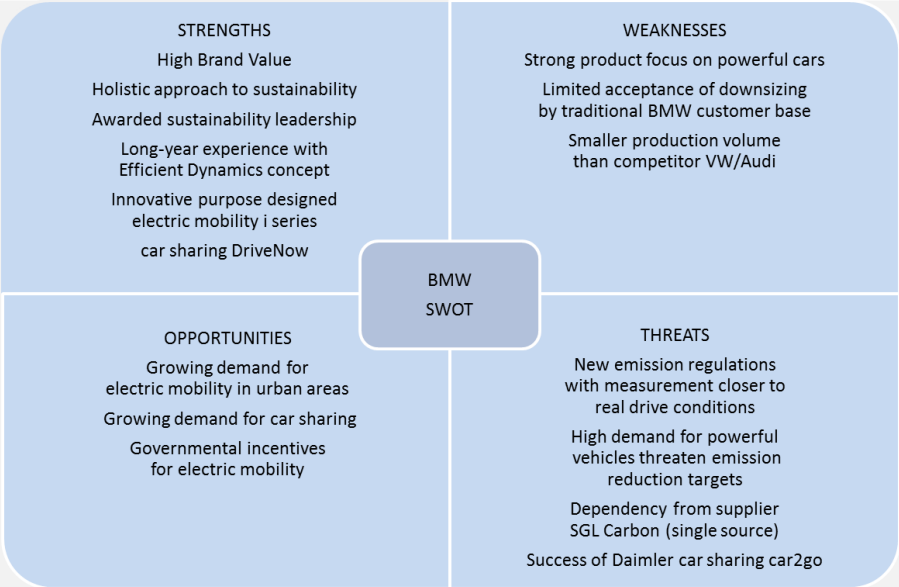
BMW's strategy of offering purpose-built electric and hybrid vehicles has to prove commercially viable. Other car companies are focusing on a manufacturing strategy that offers the production of different drivetrain technologies on the same production line. The advantage of such a strategy is that it can flexibly react to market demands for the various drivetrain technologies (petrol, diesel, hybrid, electric only). In comparison, BMW has created dedicated manufacturing facilities for the i series and its materials and components, which implies the risk of low capacity usage of those facilities.

Another challenge for BMW in meeting the EU emissions target is the ongoing strong demand for large, powerful, and heavy sports utility vehicles. Even if the company is changing their offering towards more energy-efficient and smaller vehicles, the final decision is taken by the customer. This is even more so if e-mobility is not yet cost-competitive with regard to total cost of ownership of such a product.

4.3. Lessons Learnt

To be a pioneer in certain technology always involves some risks of choosing the wrong approach or of entering the market too early. BMW is addressing those risks by following a combined strategy of evolution and revolution, which ensures economic stability by revenues and cash flow from the traditional car business while at the same time pioneering into future markets like e-mobility. A high-level SWOT (strengths–weaknesses–opportunities–threats) analysis briefly summarises BMW's current situation with regard to sustainability.

Figure 6.4. Sustainability SWOT Analysis for BMW



Source: Author.

5. Implications for Policy and Practice

5.1. What could have been done to further enhance outcomes? How could this experience be adapted or replicated?

The BMW example shows that emissions regulations by the EU and other regions impact the strategy of a car company. Furthermore, the case study shows that a proactive and innovative strategy towards sustainability and corporate responsibility contributes to a positive brand reputation and business success. If changes in the regulatory environment are to be expected anyway, such a forward-looking company strategy can lead to benefits in reputation and business success.

BMW has shown that environmental sustainability can be fun without necessarily stopping people from doing things or pursuing their preferred lifestyle.

On the other hand, BMW's sustainability strategy can be viewed in a critical way, especially in congested urban areas where the future individual mobility cannot only rely on automobiles and motorbikes but on public transport options as well. Whereas other mobility companies are pursuing a strategy with broader product range such as buses for public transport and trucks for logistics transportation, BMW is focusing on cars and motorbikes.

5.2. Principles for Policymakers

For policymakers, harmonising policies across regions should be pursued. Currently negotiated trade agreements between the US and the EU can contribute to this as these might

serve as informal standards as well for other regions in Asia and Africa. At the same time, such agreements may also lead to lowering the standards to less ambitious and challenging levels due to lobbying efforts of corporations and governments.

Such coordination provides corporations with a stable environment for investments in innovations for a more sustainable business model. Global players like BMW can no longer base their product decisions on regulations by individual countries but have to do this on a regional, if not on a global, basis.

BMW has shown that a sustainability strategy is a long process that would take many years to implement. A stable ownership structure with a long-term perspective on investment and an interest in the long-term success of the company would be very helpful in the process. Furthermore, as shown by BMW, success and leadership position are based to a large extent on the experience and know-how of a company's employees.

5.3. Conclusion: Policy Recommendations

1. Create incentives for pioneering companies to introduce industry innovations (such as viable electric mobility) and new mobility patterns (such as car sharing) for sustainability by sufficiency.

2. Set ambitious but reliable fuel-saving and emissions-reduction targets that would allow companies to consistently work on reaching those targets and do the right investments in research and development. Harmonising country-specific regulations can prevent non-productive double certifications which could instead be used to invest in true ecological improvements.

3. The transition process to a circular economy requires that a company have a sustainable economic condition. A key element in a company's economic success is the support customers lend to the company's sustainability strategy and demand for its innovative and sustainable products.

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