

# Hazard Analysis of the German Car Manufacturing Industry and related Business Eco Systems

**Günter Hofbauer**

Professor, Doctor of Science  
Technical University Ingolstadt

*Hazards and risks can endanger business systems and corresponding business eco systems (BES) in an existence-threatening way. Different reasons may cause technological changes, but stake holders should have a clear road map and strategy to guide through times of change and consider carefully the consequences. It is a matter of fact, that all industries are driven by changes in technologies, business models, processes, constellations, and systems. An appropriate response is a mandatory requirement for companies to survive. Innovativeness is the basis for competitiveness, profitability and sustainability of companies and corresponding industries.*

*The car manufacturing industry is one of the most important industries in Germany and contributes about 12 percent to German GDP. This industry is a driving force for economic growth, employment and sustainability. This situation is endangered by various hazards and the German auto industry in particular shows strong signals, which indicate a radical technological and structural change. The hazard analysis points out an aggregate of threats and challenges for the business model and corresponding BES of the auto industry in Germany.*

*The underlying thesis of this paper assumes that the existing business model is threatened. The question of research examines the influencing factors on the current business eco systems (BES) in this industry. The hazard analysis will disclose the various and complex impact factors. The transformation of the entire business system is inevitable due to the findings.*

*Methodologically, theoretical, analytical and empirical approaches are used. Research on selected literature aligned at current national and international guidelines leads to a stable basis for the research. Statistical data, topical literature, surveys, and logical conclusions will lead to justified arguments.*

**Keywords:** Business system, Business eco system (BES), Car manufacturing industry, STEP-analysis, Hazard analysis

## Introduction

Existing business models are threatened by new technologies, because a radical change is accompanied with innovations, new features, changing utilization, new possibilities but also change in mind (Hofbauer & Sangl, 2017). These new technologies cause structural changes and heavy impacts on existing business relations and practiced eco systems. These changes generate disturbances within the relevant eco systems and have impacts to the whole economy.

The BES in the sense of this study includes manufacturers, suppliers, sales channels, customers, competitors and other parties involved in upstream and downstream activities through collaboration and competition as well. A BES is a network of companies working together in a coordinated way in order to generate value through division of labor in common value chains. The total value created by a BES is higher than the sum of values of the companies on a stand-alone basis (Jacobides et al, 2018). Each member of an eco system affects and is affected by the actions and reactions of the other participants of the system (Williamson & De Meyer, 2020). In this case of research, the company orchestrating the whole process of value creation is the respective car manufacturer. In case that the car manufacturer has problems, the related BES will instantly have problems, too. For many decades the business model of producing and selling cars was a stable and profitable business. All corresponding business eco systems (BES) worked very well and they have balanced each other for the benefit of all. The BES were balanced in all directions between

all the car manufacturers, suppliers and related activities along the value chain. The existing competitive advantages especially for German brands provided high margins and concomitant a remarkably increasing market capitalization. High growth rates and high rates of return attracted more competitors to enter this business.

The actuality of the topic is that additionally, further hazards are coming up, which have the treat potential to tilt the business system and corresponding BES out of balance. The car manufacturing industry is challenged by digitalization and electrification, which push into the car manufacturing industry internally and threats from external, which are accelerated by restrictive legal regulations. More problems will arise, when technological change is combined with structural change from different origins and directions. It can be stated that besides the technological and structural change there are trade wars initiated by big players on governmental level, economic downturns in several industries in various countries, which affect purchasing power. There is also to be noticed that customers are uncertain about what technology to buy. In addition to that there is a broad skepticism about e-mobility, because the charging infrastructure is far behind demand. New technologies and radical change also attract new competitors.

It has to be considered that the car manufacturing industry has a significant impact on German economy, employment, income for employees, tax generation and wealth of nation (Hofbauer, 2020). The share of this industry of the German GDP is 12,6%. There are currently still more than 810.000 people employed in this industry with a turnover of 378 bn EUR in 2020 (VDA, 2021a). The domestic production volume in Germany was about 5.120.000 units in 2019 and decreased by 24,7% in 2020 (VDA, 2021b). The underlying working hypotheses is that the business model of the car manufacturing industry and related BES in endangered by hazards. These hazards will be analyzed in general by a STEP-analysis (Blokdyk, 2018) of external impacts and subsequently by an assessment of internal impacts within the industry (Porter, 2008). The scientific purpose of this paper is to analyze the threats to the business system and interrelated BES in order to reveal and direct the imperative transformation process to a new level in order to retrieve competitiveness and profitability.

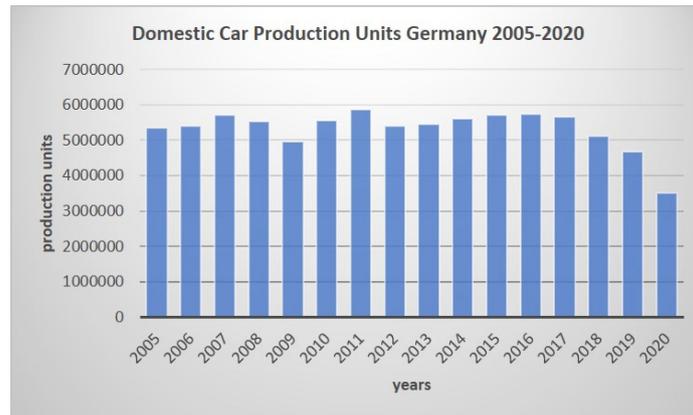
## **Results**

The results of the research include two aspects: firstly, the dependent variable representing the problem and secondly, the independent variables with impact on the dependent variable. This leads to the question of research: What are the impact factors causing the change and hazards for the business model?

### **Indication of the problem**

To start with, the current situation of the German car production industry has to be examined. In order to show the current situation of the industry, the domestic production volume of cars as the dependent variable serves as a strong and adequate indicator. This indicator represents economic factors like demand, employment, income for workers and employees, but also financial aspects for the companies like cash flows (CF), cash and cash equivalents (CCE), liquidity, profitability, dividends, reserves and sustainable finance for the auto makers (Hofbauer et al., 2017). Diagram 1 (VDA, 2021a; own graph) shows the domestic car production units from 2005 to 2020. The years 2017 to 2020 display the fundamental problem. Decreasing production and sales volumes show the empirical evidence. In 2019 worldwide sales volume decreased by 5 percent, in Germany however it fell by 8.9 percent. A dramatic fall had to be noticed in 2020. The domestic production volume dropped 24,7 percent due to covid-19 pandemic.

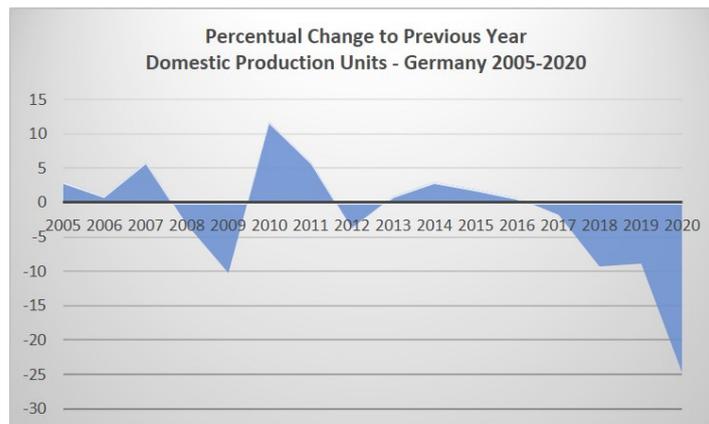
**Diagram1**



The annual percentages of growth and decline of the German car production from 2005 until 2020 are shown in diagram 2 (own work), each year in comparison the previous year. It also points out that the big decline began in 2017 with a reduction of 1.8 percent, which was followed by a drop of 9.3 percent in 2018 and 8.9 percent in 2019 until finally the pandemic caused a big slump of 24.7 percent in 2020 (VDA, 2021a).

It can be derived that the production volume was at a high level throughout the years 2005 to 2017. Except in 2009, due to the worldwide financial crisis there was a slump in the figures in 2009 to a level of 4.96 million cars. After the crisis the figures recovered and levelled off at a profitable level until the year 2017. In 2019 however, the production volume with 4.66 million units was on a lower level than in 2009.

**Diagram 2**



Considering these findings, the underlying working hypothesis for this article can be confirmed. The carefully chosen indicator shows that the German car production industry is already in severe trouble and this fact puts the traditional business model and related business eco systems in great danger. The empirical research about the causes is the starting point of the analysis of the hazards in order to detect the impact factors. This leads to the question of research: What are the impact factors causing the change and threats for the business model?

### **STEP-analysis of external impact factors**

In order to classify the influencing factors from outside the industry, a typical STEP-analysis including social, technological, economical and political issues was carried out (Blokdyk, 2018). Table 1 displays exemplarily the result of this analysis, which is self-explaining.

### Five Forces analysis of industry-internal factors

Political issues	Economical issues
Environmental protection Restrictive exhaust regulations EU postulation "zero emission" Driving bans in cities	Structural change Economic downturn Trade wars & global competition New competitors
Social issues	Technological issues
Change in behavior in general Decreasing purchasing power Global pandemic Urbanisation & mobility	Digitalization Radical change in technologies Shortened life cycles Unclear roadmap for technologies

In this part the results of the hazard analysis within the car manufacturing industry will be reported. The analysis was executed according to Porter's five forces model (Porter 2008). This conceptual model is a very useful method to analyze a business model and to identify the hazards of business eco systems as well (Dobbs, 2018). All these hazards together affect the ability of a company to make profit. A change in any of these impact factors makes it necessary for a company to rethink and rearrange the business model and related activities.

The competition within an industry is one of the possible hazards related to technological issues in table 1. Despite competition is mandatory for developed markets, competitiveness is the predominant indicator for successful companies. In doing successful business it is inevitable to understand competitors and their strategic movements. Strategies should be subject to response to any changes made by competitors. One of the most important factors to achieve high profitability is innovativeness (Hofbauer & Sangl, 2019a). According to a study about worldwide innovativeness (CAM, 2020), one can state that the three worldwide leading companies VW, Daimler and BMW are German companies. Though there is a high innovativeness to be stated, also with other measures like patent applications or innovative features per new car line etc., the car manufacturing industry in Germany and related business eco systems are threatened, because of cost pressure, which is related to economical issues in table 1. Currently there are many well established brands operating, but the cost pressure on the one side and decreasing demand on the other side force the companies to reduce cost. One of the recent strategic moves was executed by Fiat Chrysler Automobiles (FCA) with PSA Group in January, 2021. The new agglomerate was named Stellantis and is ranked fourth worldwide with 14 brands, sales volume of 134,4 bn EUR, and 5,95 million cars in 2020 (Kords, 2021a). One of the reasons was the necessity to reduce cost. But at the same time a high investment in innovation and new technologies for cars and plants is required. This leads to decreasing market capitalization whereas barriers to exit this industry are very high (KPMG, 2020).

The bargaining power of the suppliers, their cost position and performance represent another set of hazards threatening the profitability of a business system related to technological and economical issues in table 1. High performing suppliers are of strategic importance and represent competitive advantages to the company. Value driven processes all over the value chain provide market power to eco systems within the network of suppliers and OEM (Original Equipment Manufacturer) (Hofbauer & Sangl, 2019b). During the last decades a variety of well-adjusted relations with interlinked value and supply chains has been installed. That system has worked, because the bargaining power within the BES was balanced between the sourcing partners. Effective tier structures have been established and the division of labor worked efficiently (Hofbauer et al, 2016). Problems will arise as soon as radical and structural disruptions appear. With upcoming new technologies in digitalization and electrification some of the existing tier structures will be obsolete. New supplier relationships have to be established, coordinated and supervised. This

process is time consuming and cost intensive (Hofbauer et al, 2016). The bargaining power of suppliers will increase and in consequence, prices for input factors will go up and the overall cost position of the company will worsen. At the end, this means lower margins and less profitability for the car manufacturers.

The bargaining power of customers is an additional hazard for the business model, which is related to social and economical issues in table 1. Customers have the potential to put the companies under pressure as long as demand and offer are not balanced. Customers seek for new, valuable and sustainable products and of course they are sensitive to price changes or differences. The switching costs from one brand to another brand are close to zero in a market with similar products. The car manufactures can only counteract if they differentiate and individualize the products, and try to increase brand loyalty (Hofbauer & Sangl, 2018). But all these activities are very cost-intensive. Customers can also be uncertain and reluctant to buy cars. The uncertainty is derived from the doubtful electromobility with low reach, unclear subsidies for buyers, and still missing infrastructure with unstandardized charging stations. This issue refers to political issues in table 1. The reluctance is intensified by different attitudes towards cars and mobility. One reason is that 37 percent of the so-called millennials do not need, do not want or cannot afford an own car. This means 37 percent out of 1.7 million people and accounts to 629.000 unsold cars. For this segment it is more important to have access to mobility than to own a car (Zukunftsinstitut, 2015). A typical indicator of customers' behavior can be derived from a survey asking (n = 23.191) people, representing typical car buyers, about planning to buy a new car or a used one in the next two years in Germany, as of January 1st of each year (IfD Allensbach, 2020). The proportions were projected to 70,64 million potential buyers. After the peak in 2018 with 8.11 million people in total planning to buy a new or used car the figures were decreasing to 7.6 million in 2019 (-6%) and 6.57 million in 2020 (-13,5%). This was a decrease in absolute figures of 1.03 million cars in 2020, thereof 300.000 new cars less than in 2019. One reason for this is the uncertainty of the prospective buyers and the concurrent reluctance to buy. This uncertainty is caused by external hazards as shown under political issues in table 1, including driving bans, speed limits, tolls, restrictive legal regulations and further on with ideologically driven discussion about cars with combustion drives. Another suitable indicator is the period of utilization. Statistical databases (Kords, 2021b) show that the age of cars on average was steadily increasing in the German car market from 6.9 years in 2000 up to 9.8 years in 2021. This means that the market for new cars in total is shrinking. From the companies' perspective this implies that a battle for customers will arise in the shape of a price war and along with it, the bargaining power of customers is put into effect. In consequence this means lower prices for customers and correspondingly lower revenues for the companies, but higher spendings for marketing activities to attract customers. Thus, bargaining power gives buyers the ability to squeeze industry margins.

A further hazard is the replacement through substitutes, which refers to technological, economical, social and political issues in table 1. A substitute is a product that can be used in place of another to fulfil the same purpose. In the course of this, the substitute may use the same technology or a different technology to serve the same need. In the case of cars, a substitute for mobility could be a taxi, car sharing or ride sharing, where the same technology, namely cars, is used. For the customer it makes no difference, the user just needs mobility. But for the car manufacturing industry it makes a difference in terms of production volume. There are also different modes of public transport, which is becoming more and more competitive with individual car traffic. An important political issue according to table 1 are political issues limiting individual mobility like driving bans, restricted areas, restrictive traffic management. High toll fees and parking fees for car traffic raise the attractiveness of public transport additionally (BMVI, 2021). Sufficient offers of available substitutes in the market are a crucial requirement for the acceptance of substitutes. The

availability of close substitutes and the ease of substitution relieve and accelerate the utilization. The switching costs of the customer are an important determinant for the use of substitutes. It is a matter of fact that switching costs in general are a reason for rejection. The best example in the mobility industry is Uber, because it is very easy for customers to switch from regular taxi to Uber. No switching costs and in addition more comfortable, the whole process digitized, which is very user friendly, and even cheaper than a normal taxi ride. All these reasons from high availability, ease of use as well as cost efficiency of the substitutes in the mobility market generate a highly competitive environment for the status of having an own car. This upcoming situation of free choice in abundance is good for the customers, but very disadvantageous for the car manufacturing industry and threatening for related business eco systems.

Last but not least there is the hazard of displacement through new entrants, coming from other industries and seeking for new investment opportunities. This topic mostly refers to technological and economical issues in table 1 as enablers, but also to social and political issues as accelerators. In order to protect the business system and the corresponding business eco systems, it is important to keep barriers to entry high for competitors. If the barriers are high, the threat of new entrants is low. If the barriers are low, the risk of new competitors venturing into a profitable market or business eco system is high. Barriers to entry are competitive advantages that established companies have and should protect. Through the emergence of structural and technological disruptions, strategic windows will be opened, because existing competitive advantages are annihilated and new competitive advantages will be installed. In the car manufacturing industry, the advantages around combustion engines will be pushed back and new barriers around electric drives will be established. Game changers strive to kick out established players in order to achieve market share. In consequence, the new entrants put pressure on prices, costs and investment rates needed to sustain in established business within the industry. The threat of new entrants is extremely intense, because they diversify from another profitable market as they can leverage existing know-how, budgets and brand identity. Companies like Apple, Google and Amazon have earned a lot of money in completely different businesses. Now they are looking for diversification possibilities. The strategic window to enter the car and mobility market is opened due to the upcoming digital and electrical revolution. These entrants have large amounts of capital at their disposal to enter and develop new markets like the mobility market, where high growth rates and high profitability are expected. In the near future customers can decide about the offers of new entrants, because switching costs will be close to zero. As customers transfer perception and brand identity (Hofbauer & Hofbauer, 2020) a remarkable share of potential customers is willing to buy an i-car from Apple. The results are astonishing, because nobody has seen or even driven a car from Apple so far. Nevertheless, in India 81 percent expressed their willingness, in Germany this study indicates 32 percent willing to buy an i-car. This survey was executed in seven countries with n=7.553 people interviewed. In total, a high share of 65 percent among the group of 18-34 years old people answered positively (Capgemini, 2015). Another study on this topic provides a closer view on the German auto market (Autoscout24, 2021). In this study n=1000 respondents were asked about their intention to buy a car from Apple. The weighted average of positive answers for men and women groups totals 27 percent. These results are quite positive, especially when considering that about 40 percent do not particularly exclude this option answering with maybe. From the strategic point of view, the most attractive market for established BES is one in which entry barriers are high and exit barriers are low. The entry barriers into the car manufacturing industry were kept very high, because of well working eco systems so far mainly based in particular on know-how of combustion drives and dominance in the market. Due to digitalization and electrification of the car manufacturing industry the entry barriers decreased to an acceptable level for new entrants.

## Conclusions and Recommendations

With regard to the working hypothesis it can be stated that the German car production industry is in severe trouble and correspondingly, the traditional business model and related business eco systems are endangered. The success and sustainability of this industry is in trouble, because pressure is on this system due to analyzed hazards. The question of research 'What are the impact factors causing the change and threats for the business model?' can be answered accordingly: there are various, complex, and overlaying forces which have an impact on the current business model and corresponding business eco systems of the car manufacturing industry in Germany. The external issues have been analyzed with the STEP-analysis and the industry-internal impact factors have been assessed according to the five forces concept. The combination of these forces together will lead to a shrinking market. The new entrants will increase the rivalry, which will lead to a cut-throat competition, ending up with a shakeout and market adjustment of the current players and corresponding business eco systems. The advantage of the new entrants is that they can start business using the new technology right away and do not have a legacy with old technology. Current car manufacturers will suffer market share losses. An extensive consolidation process will be the consequence.

The empirical analysis evidently shows that the difficulties and problems are serious and not just temporary. The trend line of the domestic production volume as a suitable indicator significantly points downwards. A very crucial consequence thereof is the financial aspect for car manufacturers. The forecasts for the financial side don't look promising. Less production volumes mean less cars to be sold and this means less turnover and correspondingly less cash flow, and this in turn means shrinking investment budgets for necessary innovation projects and less potential for sustainable finance. Price erosions on the market reduce cash flows additionally. A shrinking market due to substitutes, buying reluctance and no need to buy, because of a longer period of usage combined with price wars and higher efforts for marketing and sales means at the end lower margins and less profitability in this industry. Higher cost positions on the supply side worsen the margin on top of that. In total, this shows that the financial situation deteriorates and thus the market capitalization worsens. This should be an alarm signal to all stake holders, because the once successful business model is endangered.

There is no doubt that the car manufacturing industry has an outstanding importance for German economy. Therefore, it is urgently necessary to support this industry to enable the completion of the technological transformation for electrification and digitalization.

### References:

1. AutoScout24 (2021). Umfrage zum Kaufinteresse an einem Auto von Apple in Deutschland nach Geschlecht 2021. Retrieved from <https://de.statista.com/statistik/daten/studie/1224258/umfrage/umfrage-zum-kaufinteresse-an-einem-auto-von-apple-in-deutschland-nach-geschlecht/>
2. Blokdyk, G. (2018). PEST Analysis: Standard Requirements. Independent Publishing
3. BMVI (2021) (Bundesministerium für Verkehr und digitale Infrastruktur). Daten für die Mobilität der Zukunft. Retrieved from <https://www.bmvi.de>
4. CAM (2020) (Center of Automotive Management). Automotive Innovation Report 2020. Retrieved from <https://www.auto-institut.de>
5. Capgemini (2015). The Selfie Experience, Cars Online 2015. Retrieved from <https://fr.slideshare.net/capgemini/cars-online-2015>
6. Dobbs, E.M. (2014). Guidelines for applying Porter's five forces framework: a set of industry analysis templates. *Competitiveness Review*, 24(1), 32-45
7. Hofbauer, G. (2020). Significance and Economic Impact of the Automotive Industry in Germany,

Proceedings of the XVIII International Scientific Conference "Management and Engineering '20, TU Sofia/Bulgaria, 500-509

8. Hofbauer, G. & Hofbauer, K. (2020). Kundenverhalten, Wie Psychologie und Soziologie den Kauf beeinflussen (2nd ed.). Berlin: uni-edition
9. Hofbauer, G., Klimontowicz, M. & Nocoń, A. (2017). The Impact of Capital Requirements on Companies' External financing. *Journal of Modern Accounting and Auditing*, 13(1) 8-18
10. Hofbauer, G. & Sangl, A. (2017). Innovation Management and Particular Impacts on Companies and Economy. *Conference Proceedings Challenges of Globalization in Economics and Business*, Tbilisi State University/Georgia, 672-680.
11. Hofbauer, G. & Sangl, A. (2018). Professionelles Produktmanagement, Der prozessorientierte Ansatz, Rahmenbedingungen und Strategien (3rd ed.). Erlangen: Publicis
12. Hofbauer, G. & Sangl, A. (2019a). The German Automotive Industry as a Driving Force for Innovation. *American Journal of Engineering Research*, 8(10), 90-99
13. Hofbauer, G. & Sangl, A. (2019b). A Proposition for an Updated Configuration of the Value Chain. *International Journal of Advanced Engineering and Management Research*, 4(05), 115-134
14. Hofbauer, G., Mashhour, T. & Fischer, M. (2016). Lieferantenmanagement, Die wertorientierte Gestaltung der Lieferbeziehung (3rd ed.). München: De Gruyter
15. IfD Allensbach (2020). Umfrage in Deutschland zur Autokaufabsicht nach Neuwagen und Gebrauchtwagen. Retrieved from <https://de.statista.com/statistik/daten/studie/170981/umfrage/kaufabsicht-nach-neuwagen-und-gebrauchtwagen/>
16. Jacobides, M., Cennamo, C. & Gawer, A. (2018). Towards a Theory of Eco Systems. *Strategic Management Journal*, 39(8), 1-38
17. Kords, M. (2021a). Stellantis: 14 Automarken unter neuem Dach. Retrieved from <https://www.statista.de>
18. Kords, M. (2021b). Durchschnittsalter von PKW in Deutschland bis 2021. Retrieved from <https://www.statista.de>
19. KPMG (2020). Global Automotive Executive Survey 2020. Retrieved from <https://www.automotive-institute.kpmg.de>
20. Porter, M.E. (2008). The Five Competitive Forces That Shape Strategy, *Harvard Business Review*, January 2008, 1-17
21. VDA (2021a) (Verband der Automobilindustrie). Facts and figures – number of employees. Retrieved from <https://www.vda.de>
22. VDA (2021b) (Verband der Automobilindustrie). Facts and figures – production. Retrieved from <https://www.vda.de>
23. Williamson, P. & De Meyer, A. (2020). *Ecosystem Edge: Sustaining Competitiveness in the Face of Disruption*, Stanford: Stanford Books
24. Zukunftsinstitut (2015). *Automotive Zeitgeist Studie 3.0, We-Mobility – eine Trendstudie über Millennials*. Retrieved from <https://www.zukunftsinstitut.de>