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Digitalisation and Change in the German Automotive Industry

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The German automotive industry has been shaken to its core by the combined effect of two disruptive forces - decarbonisation and digitalisation – that are simultaneously impacting the industry, instigating major change. New business models and partnerships are emerging. How will the major automotive companies adapt and survive?

The German automotive industry

For over a century, the German automotive industry has set international standards in automobile manufacturing. It was an era in which German automobiles became the epitome of top-quality workmanship worldwide, a time when Volkswagen, Mercedes-Benz, BMW, Porsche and Audi were known for their finely tuned combustion engines and powertrains. The German car was at times considered "the car" par excellence. This era is now coming to an end.

The German automotive industry consists of original equipment manufacturers (OEMs) and a three-tier supplier network. According to [Statista](#), there were a total of 933 companies active in the German automotive industry in 2021, and the German based OEMs Volkswagen, Daimler and BMW were among the top 10 car manufacturers worldwide. In the 2010s, companies achieved one sales record after another. However, the 2020s will be marked by a longer-term structural change.

Decarbonisation and digitalisation

The impacts of decarbonisation and digitalisation are bringing about [major change in the industry](#). The decarbonisation of the transport sector and the associated switch to

alternative drive systems and fuels is taking place in parallel with advancing digitalisation with effects on vehicle production and mobility offerings. In 2016, Daimler created the acronym [C.A.S.E.](#) for the technology and market trends faced by the automotive industry: connectivity, autonomous driving, shared services and electric mobility. Digitalisation is often seen as the trigger for these “megatrends”, each of which has the potential to turn the entire industry upside down and destroy the existing business models (Figure 1).

Digitalisation itself is having repercussions on the way automotive industries function, notably in the production area. “Smart factories” combine a variety of the so-called [“Industry 4.0” technologies](#), such as robots connected to the Internet, and the use of high-performance computers for machine learning and data analysis. Looking to the future, the [Industrial Internet of Things](#) (IIoT) will be deployed to network production facilities worldwide. IIoT devices will regulate the flow of data between plants and control all logistics for parts, procurement, production and distribution. [Digital twins](#) will also use IIoT devices to monitor and support production in real time. Siemens and Daimler are cooperating on the development of a fully digitised model factory for the Mercedes plant in Berlin-Marienfelde, which is to become a pioneer for all 30 Mercedes plants worldwide.

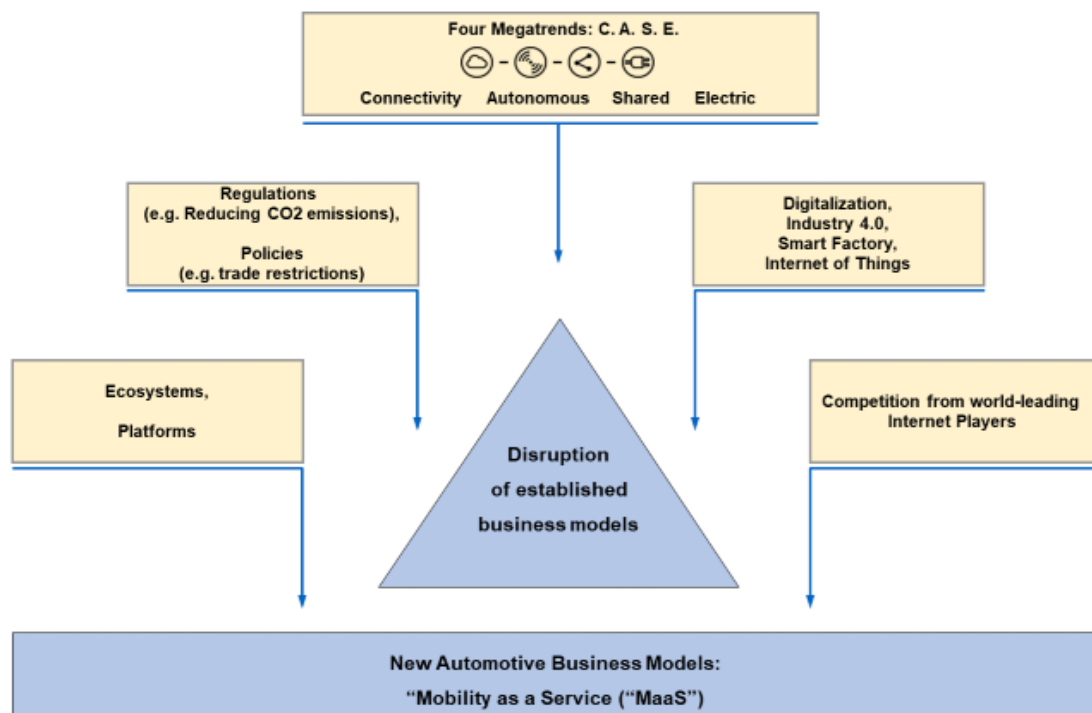


Figure 1. External environmental changes in the German automotive industry ([Felser and Wynn, 2020](#)).

New partners for a new era in automotive development

These changes are forcing Germany's flagship automotive sector to invest considerable resources in attaining new knowledge through research and development, and to partner with the big tech players. [Recent research](#) has examined how the industry is changing its sourcing strategy accordingly. Nvidia and Qualcomm are dominating the provision of chips for the central on-board, computer, and are increasingly offering [software for automated driving](#) (Figure 2).

There have been a number of initiatives to create cross-industry platforms involving major tech players. In 2019, BMW and Microsoft founded the [Open Manufacturing Platform](#) based on Azure cloud. The objective is to create an industry-independent and standardised production platform based on open-source software. Knowledge, data, new technologies, and everything that drives the development of innovations can thus be shared more easily. Similarly, [Volkswagen](#) has been working with Amazon AWS and Siemens to develop an industrial cloud that will connect all 122 of its plants to further invest in factory automation and to make use of a large amount of technical data. The industrial cloud is based on AWS technologies in the areas of IIoT, machine learning, data analytics and computing services. The solution is being developed as an open industry platform that other partners from industry, logistics and sales can use as well. This is intended to create a steadily growing global industrial ecosystem.

Car operating system / infotainment		Automated driving	
Nvidia	Qualcomm	Nvidia	Qualcomm
Audi	Build Your Dreams (BYD)	Audi	BMW
Hyundai/KIA	General Motors	Aurora	Ferrari
Mercedes	Honda	BYD	General Motors
	Nio	Cruise	Great Wall Motors
	Opel/Peugeot	Jaguar Land Rover	Renault
	Renault	Lucid	Volkswagen
	Smart/Geely	Mercedes	
	Stellantis	Nio	
	Volvo/Polestar	Pony.AI	
	Xpeng	Toyota	
		Vinfast	
		Volvo/Polestar	
		Xpeng	

Figure 2. Chip-cooperation between big tech players and the global automotive industry for the central on-board computer (based on [Handelsblatt, 2022](#)).

German companies are in **bold** typeface.

New relationships within the automotive supply chain are also being forged. Volkswagen and Bosch recently announced [a partnership](#) to develop and launch highly automated driving functions in all VW vehicle classes, also making them available to other manufacturers. Both companies declared this as a paradigm shift in the cooperation between an OEM and a tier-1 supplier. This partnership is seen as a challenge to the involvement of US technology companies in car operating systems. Bosch aims to become the leading supplier of application-independent vehicle software in the future.

In summary, the car has become a complex IT product, with leading companies now specialising in vehicle-related computer programmes and mobility services. Software is increasingly becoming the key differentiation criteria in the automotive industry. The automotive companies will need partners, due to a lack of expertise in software development for connected cars, and thus value-adding sourcing is of particular significance. The industry is now entering into a series of strategic partnerships in connection with “Car IT” and automated/autonomous driving. As recently noted by [Wiegand and Brautsch](#), “the established companies are faced with a multi-dimensional disruption initiated by new technology leaders. This will radically change existing business models by establishing a new culture of use for the automobile, based on new digital networking and operating platforms. Future success will depend more on capabilities in the field of digital product features and connectivity, than on developing and producing cars”.

Reference

Felser, K. and Wynn, M. (2020) Digitalization and Evolving IT Sourcing Strategies in the German Automotive Industry. *International Journal on Advances in Intelligent Systems*, 13 (3/4). pp. 212-225. Available at: <https://eprints.glos.ac.uk/8670/>

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