New Work in the Automotive Industry

15.1 The Automotive Industry as Driver for New Work

The automotive industry is one of the most important industries in the European Union. This industry sector provides direct and indirect jobs to 13.8 million Europeans, representing 15.1% of total EU employment. 2.6 million people work in direct manufacturing of motor vehicles, representing 8.5% of EU employment in manufacturing. The EU is among the world’s biggest producers of motor vehicles and the sector represents the largest private investor in research and development (R&D). To strengthen the competitiveness of the EU automotive industry and preserve its global technological leadership, the European Commission supports global technological harmonization and provides funding for research and development (R&D). The automotive industry has an important multiplier effect in the economy. It is important for upstream industries such as steel, chemicals, and textiles, as well as downstream industries such as Information and Communications Technology (ICT), repair, and mobility services. Around 13.8 million people work in the EU automotive sector. Manufacturing (direct and indirect) accounts for 3.5 million jobs, sales and maintenance for 4.5 million, and transport for 5.1 million. The turnover generated by the automotive industry represents over 7% of EU GDP. 80% of the growth in the sector is expected to occur outside the EU. The EU’s efforts should focus on concluding and enforcing preferential trade and investment agreements. These will make it easier for European companies to access third markets and continue benefiting from economies of scale (European Commission, 2020). The

The man who moves a mountain begins by carrying away small stones.

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15.2 Paradigm Shift and Transformation in the Automotive Industry

Our working world and society are faced with new tasks that can no longer be mastered with “old” work structures. The call for more freedom and creative and individual working methods is being voiced by both employees and employers. With the “New Work” concept, Frithjof Bergmann laid a foundation on which the company is now actively building (Bergmann, 2019).

The basic idea of New Work arose from a wave of automation in the automotive industry in Flint, Michigan in the USA. The philosopher and subsequent founder of the “New Work movement” Frithjof Bergmann worked there in a factory and in 1984 installed a “Center of New Work” to give those factory workers the opportunity to find out what they “really”, really want. “With automation, their activities on the assembly line were no longer needed, so an alternative had to be created”. This gave rise to a concept that has become a little independent today. Bergmann himself defines the goal as follows (Bergmann, 2019). The new was seen as the opposite of the capitalist work model. Instead of being laid off because machines were taking
over their own work, the time freed up was spent finding their own calling, with the support of the company. The focus of New Work is on people and their development. It is the fight against work, “which you endure like a ‘mild illness’” and thus something more than what is hidden behind Work 4.0 (Helmold, 2020). New Work should not only make existing work more attractive, which Bergmann also likes to refer to as “cosmetic corrections to the wage labour system”. Rather, it is about “work that excites you, that captivates you that puts you in a blissful tumult”.

The automotive industry in Germany and Europe is under pressure and undergoing a paradigm shift. With new business models from Silicon Valley and China and stricter environmental standards. The automotive industry is threatened with decline. With drastic consequences for employment. To prevent this, we need a reform of transport and infrastructure policy. The federal government must create a future pact for mobility in order to transform the automotive industry. The pressure to change comes primarily from the four megatrends: digitization, urbanization, sustainability and individualization. In addition, there are technical innovations that are rapidly revolutionizing the automotive industry: sooner or later the electric motor will replace the internal combustion engine. If the German automakers are not careful, Silicon Valley and China will overtake them unassailable. It is important to completely rethink: The business model of the future no longer focuses on the car alone, but on mobility as a whole.

The mobility transition will be so far-reaching that new regulation of the automotive industry and internal company transformation will not be enough. Rather, politics, companies, trade unions and consumers must tackle a new policy together. This is the only way to achieve a fundamental transformation of the automotive industry. It is important to include all those affected. Large car manufacturers such as suppliers, federal and state governments as well as municipalities. In order to secure locations and employment, a joint future pact for mobility is needed. The time is right, because the industry currently has the necessary resources for such a profound transformation. Our study shows: there is no time to hesitate. Otherwise the successful model of the German automotive industry could soon be history.

15.3 Transition to Automotive 4.0

The automotive industry is in a historically unique situation of upheaval. The business of the German model industry is currently going well. At the same time, however, with digitization, autonomous driving and electric mobility, changes are imminent that are radically revolutionizing the market. How are car manufacturers and suppliers in Germany repositioning themselves for this? Does the future lie in the creation of a dominant digital platform, comparable to Apple in the area of smartphones? Or rather in the role of a hardware provider à la Foxconn? The questions are all the more exciting as there is currently a great deal of uncertainty about many factors. The answer from the experts at Deloitte: scenario-based strategy building helps the industry with positioning. Deloitte has developed a model for this
that makes it possible to represent different options for action. An insight into the
dramatic challenges for the industry—and into concrete solutions.

### 15.4 Challenges: Drive Technology and Digitization

For a long time, the success of the automotive industry in Germany has been based
on expertise in the field of combustion engines. German engineering is admired and
valued worldwide. However, this technological leadership could become obsolete in
the future because electric mobility is coming—and it is fundamentally changing
the rules of the game in the industry. Regulatory requirements from politics and
ecological reasons have brought the combustion engine into criticism. Even if elec-
tromobility is not yet profitable today—battery technology is getting better and
cheaper and the market share is growing. Research and investments in the field of
electric drives—and in other alternatives such as the fuel cell—are therefore inevi-
table for OEMs. Battery technology, for example, requires you to make strategic
decisions about your own development or acquisitions.

For suppliers, the situation is almost even more acute. Since electric drives are
mechanically different and, above all, more simply constructed, established compo-
nents of the internal combustion engine such as gearboxes are largely superfluous.
The task for manufacturers and suppliers is now to skilfully shape the transforma-
tion to new products and business areas. For companies and shareholders, there may
well be a long dry spell before electrically powered vehicles really become a profit-
able business around 2020/21.

#### 15.4.1 Digitization and Autonomous Driving Enable New Business Models

It is all the more important to establish new business models through digitization,
intelligent assistance systems and a data-based “ecosystem” for services. Even if it
is not yet ready for the market today, autonomous driving is at the fore here. Hardly
any other technology will revolutionize mobility in such a way. And research is
progressing at a great pace despite isolated setbacks. Together with the sharing
economy and trends such as urbanization and change in consumption, this “future
technology” is also changing the relationship between consumers and car
ownership.

Having one’s own car tends to become less important. In electromobility, the
performance data, driving dynamics and comfort of automobiles are increasingly
converging. This reduces the possibilities for manufacturers to differentiate their
own vehicle on the market. The customers of tomorrow may no longer focus pri-
marily on performance features or the image of engineering when buying or book-
ing, but more on the attractiveness of a brand’s mobility platform. Manufacturers
should therefore invest in their development and research today. Fleet management
and car sharing are becoming increasingly important. This already shows the spread
of services around the world such as car2go (Daimler) and DriveNow (BMW), which are currently planning their merger, or Uber. In connection with autonomous driving, this field will only show its true disruptive potential. The self-driving connected car also offers interfaces for communication with customers, for after-sales and innovative business areas such as embedded software, infotainment, in-car payment, data-based services and data processing. The car has to be rethought—it becomes a “device on wheels”, analogous to other technical devices such as smartphones. Strategically successful companies are showing how an established technology—in this case the mobile phone—can function as a springboard for a whole range of “new” digital services, from music streaming to payment services, thanks to digitization. The only question for the automotive OEMs in Germany is whether they really want to and can compete with the concepts of the large digital corporations in all fields. Such essential strategy aspects can be clarified using the Deloitte Automotive Value Chain Model.

Deloitte’s scenario approach suggests a path through the thicket of current uncertainty and helps companies with strategic orientation. Choosing the right scenario is crucial, but of course it has to be based on the individual circumstances of the car manufacturer or supplier. Depending on the chosen scenario, different priorities then result. In this way, initial “no-regret moves” can be identified, such as investments in Industry 4.0, electromobility and autonomous driving, which are always necessary to secure the future. But the change in the workforce must also be shaped: While most scenarios foresee a decline in jobs in production, a digital workforce should also be set up for the demanding work on the transformation. In addition, signs of the tendency for further developments in politics and society must be continuously monitored, for example in the area of regulation, in order to adapt the strategy in an agile manner. In any case, the key is to develop and consistently implement a clear strategic vision—the faster the better. In this way, manufacturers and suppliers avoid the fate of “fallen giants” like Nokia in the smartphone sector and proactively shape their future. With the detailed model of the Automotive Value Chain and its extensive expertise, Deloitte supports companies in the optimal strategic positioning for Automotive 4.0.

15.5 Future of the Automotive Industry

Despite concerns about a global economic slowdown, shifting consumer preferences and redefining transportation, the automotive industry has to look to talents and New Work concepts to have a successful transformation (Helmold, 2020). In the transformation of industries around the world, perhaps no sector is undergoing a more rapid change than the automotive industry. From the proliferation of electric vehicles to the rise of self-driving cars to increasingly stringent emissions standards, a number of trends are forcing automakers to not only redefine their business but also entirely rethink the concept of transportation. For employers and workers in this business, to thrive in today’s dynamic digital economy requires new skill sets and ways of working even as the global market appears headed for a slowdown.
According to the New York Times, car manufacturers around the world employ about eight million workers directly, with millions more indirectly working for component manufacturers (Ewing, 2020). With global sales in 2018 declining for the first time since 2009, the sector is struggling this year as producers such as those in Germany are reporting significant declines in domestic and overseas sales. Similarly, CNN reports that 330,000 automotive-related jobs have been lost in India due to its slumping market, with further cuts that could total one million. Despite the threat of a global recession, car makers are pressed to move ahead with transforming their business. With each new model, the industry is rolling out innovation aimed at delighting consumers and business customers. From reimagining the connected vehicle as an entertainment and shopping hub to developing a vast fleet of self-driving cars, the priorities of manufacturers are being driven by technology and shifting consumer demands. At the same time, changes in how customers use their cars, as assets in the sharing economy, for instance, means auto makers are considering how best to support these activities.

The question is what the automotive sector is doing to successfully change? Changes are not only visible in B2B and B2C models, but also in the adoption of virtual elements across all functions and departments (Schmidt, 2019). Already an early adopter of automation and robotics, the industry is now aggressively investing in AI and other technologies to become more efficient and forward-thinking. According to Accenture, the technology change in this the sector is redesigning jobs so workers can deliver more value-added roles such as quality control rather than routine work such as assembly. Manufacturers are also leveraging augmented reality and image correlation algorithms to address quality issues. In the post-digital era, traditional automotive industry players will benefit from a new technology framework that can guide and accelerate their forward momentum. This framework comprises three core elements:

1. **New Technologies**: Leaders need to continually integrate new technologies into the business. AI, Extended Reality solutions, 3D Printing and Distributed Ledgers are just some of the new technologies being used to reinvent business value chains and customer experiences. In many cases, the efficiencies or new revenue streams enabled by these technologies deliver a quick return on investment, which can fund further growth.

2. **A new technology strategy** and operating model geared for innovation. In the post-digital world, a company’s technology strategy and business strategy must be woven together to shape a vision for the future. Driven by the CEO, this combined strategy must permeate the organization. An environment of experimentation, a culture of collaboration, agile methods, lean operations, new enterprise architectures and design thinking all play a role. So does a new focus on ecosystems and new roles and skills of a human+ workforce.

3. **A future-ready technology foundation**. Automotive manufacturers and suppliers will need to continually embrace emerging technologies and decouple core architectures to unlock new value. Winning players will understand the data at their disposal, as well as the potential uses of that data, to open new opportunities. A new approach to cyber-security will also be a critical component of a
future-ready technology foundation. In the post-digital world, in which ecosystem partnerships and data-sharing become more common, the risks of hacking rise exponentially. Securing ecosystems must become a priority.

In the back-office, AI is already helping to accelerate the recruitment effort. Intelligent software that source, screen and engage job seekers help automotive employers to find talent more quickly and efficiently. This is an important consideration because the industry is now competing for many of the same high-value skills sought after by Silicon Valley, and it can’t fall behind in the competition for engineers, programmers and developers—all of whom are critical to developing new features and innovations demanded by car buyers. Moreover, AI will be integral to enhancing the quality and output of work delivered by humans. AI-enabled decision-making based on data will help humans to focus on creating value rather than fulfill tactical tasks. AI is already an important tool for managing the supply chain, which in the automotive industry is an outsized lifeline. However, AI is just one area of reskilling. As the industry has become automated and focus on quality, today’s line workers are also expected to have more skills to use robotics, data-driven systems and RPA (Robotic Process Automation). At the same time, digitalization is also transforming nearly every aspect of the business, from customer-facing activities undertaken by sales and marketing to back-office functions including HR, F&A, procurement, legal and others. This means to continue to drive efficiency in an industry that brought forth the lean concept, the sector must reskill many of its workers to be high performers in a digital and highly connected business environment. Accelerating the capabilities of its workforce should be a priority for the entire auto industry, and not just those seeking to create electric or self-driving cars. This is an especially important task as global demand softens and uncertainty settles over the industry. Only through innovation and workforce agility will automakers survive and thrive in today’s dynamic market changes.

15.6 New Work in the Automotive Industry

15.6.1 New Work and Virtual Technology as Innovation Driver

The automotive industry has been the innovation driver in the past year for new paradigms and concepts. Autonomous driving, e-cars, digital services and mobility platforms: High product quality and brand reputation still matter but the climate change and other incidents like the Diesel scandal have changed the environment of this sector, while attributes like technological innovation and transparent cost of ownership rapidly move to the top of what customers want from a car. To maintain a competitive and top leadership position in the automotive market and survive for the long term, companies will have to virtually reinvent themselves (Gnam, Kalmbach, & Bürgin, 2018). The next generation of leaders have started to embrace some common principles as they reinvent themselves in the face of cost pressures (Helmold, 2020). New Work concepts will be one driver for this successful change. Another important element for a successful transformation will be the
implementation of social standards for stakeholders and employees (Helmold, Dathe, Dathe, Groß, & Hummel, 2020). New Work can be implemented in various areas like Work Office Layout, Production Planning, Production Management and Execution and Product Development as shown in Fig. 15.2.

15.6.2 Virtual Workplace and Work Station Management

Reskilling and revolutionizing the workforce in the automotive industry are essential in an age where man and machine are on the same team. New Work areas can be identified in the areas of workplace and work station management. Employees of automobile companies work with specialized and virtual equipment, tools and materials in order to simulate work operations and processes in production or other functional areas like procurement, warehousing or sales. This concept is suitable for tasks and specific technical skills, which cannot be obtained through theoretical
classroom learning. Therefore, automobile companies have to train all new employees.

It is necessary for automakers to provide constant training for their qualified employees as well. Technology is always evolving, and it is crucial to keep knowledge and skills up-to-date. Virtual reality training is well suited for complex skills development and working out different scenarios. Therefore, many car manufacturers, including Volkswagen, Audi, and BMW use virtual reality in their training programs. Another possibility is the ergonomic evaluation of work places. Ergonomic assessment is a physical therapist’s or other specialist’s evaluation of a workplace and its furnishings, tools, and tasks in relation to the physical abilities of the worker. It is also known as work activities evaluation and treatment. There are five aspects of ergonomics: safety, comfort, ease of use, productivity or performance, and aesthetics.

**15.6.3 Virtual Production Planning (VPP)**

Virtual technologies in combination with New Work now allow to plan virtual plants, simulate their functions and eliminate errors before they are implemented. This creates a virtual image of the plant, the planning process and activity within the production planning process. Virtual reality provides the possibility to create 3D tools and to carry out feasibility and capability studies.

**15.6.4 Virtual Production Management (VPM)**

Virtual Production Management is the use of computers and virtual reality to model, simulate and optimize the critical operations and entities in a factory plant. Virtual manufacturing started as a way to design and test machine tools but has since expanded to encompass production processes and the products themselves. The main technologies used in VM include computer-aided design (CAD), 3D modelling and simulation software, product lifecycle management (PLM), virtual reality, high-speed networking and rapid prototyping. Virtual Production Manufacturing provides an organization with the ability to analyse the manufacturability of a part or product as well as evaluate and validate production processes and machinery and train managers, operators and technicians on production systems.

**15.6.5 Virtual Product Development (VPD)**

Virtual Product Development is the practice of developing and prototyping products in a fully digital 2D/3D environment. It consists of four main components: virtual product design virtual product simulation virtual product delivery digital manufacturing. Virtual process planning is a relatively new concept for manufacturing companies, although the concept has been in use for the construction industry for several
years. BIM (building information modelling) is the system used by many constructions, architectural and contracting firms. The detail and scheduling aspects are some of the more valuable aspects of the system. By utilizing virtual process planning, the entire production process can be designed to both maximize efficiency and avoid the trial and error method employed by most manufacturers. Various softwares exist with differing levels of information. The placement of work stations, inventory, personnel and equipment can be valuable for space planning. The interaction of the previously mentioned can also be investigated, allowing the user to identify potential issues from safety, quality and ergonomic standpoints. Virtual Product Development, VPD, is a result of constant efforts in a direction to overcome the limitations of conventional testing procedures. VPD allows a designer to take important design decisions at early stages based on test results, giving control over cost. ‘Virtual product development’ is a strategy for coordinating technology, processes and people to enhance the established product development process. It is a gradual process that efficiently builds up a product virtually. Thus, any changes to be made in its design can be reflected into its physical properties, supply chain, distribution channel and ultimately into the customer view; without physically manufacturing the product. VPD encompasses a wide variety of software tools to cover a product from the conception to the final design and even manufacturing. This path consists of various processes to be carried out at manufacturing level, testing procedures and the final design which is modified automatically based on the test results. One of the major advantages of VPD is its computer brain capability, which can simulate various complex load conditions at a time. Non-linear load conditions are not always possible to create at the testing centre where the prototypes are being tested in conventional testing methods. These complex conditions, if accommodated in the testing, can yield more reliable product form.

15.7 Case Study: BMW Applies Virtual and Augmented Reality in Production

The automotive company BMW is providing an insight into its application of virtual and augmented reality in the company’s production system. The company says the fast and flexible planning of new workstations in production is made possible by virtual reality and digitized 3D factory data. It’s still a learning process but augmented reality technologies is making it possible to design training courses without any coding knowledge. It also enables comparison between the camera image and CAD models for fast, straightforward quality checks of parts and vehicles (Edwards, 2019). VR images, or artificially created images, are ever more realistic and hard to distinguish from real pictures. In AR applications, illustrations complement real images. AR and VR images can be viewed in special headsets or on normal tablet computers. In production, these images are powerful tools in numerous use cases in training and qualification, planning of workstations at the assembly line, or quality control. In all applications, the technology keeps modestly in the background. No extensive IT expertise is required to use these applications efficiently. Thanks to
VR, planners in construction, plant engineering, logistics and assembly can now assess new production areas completely virtually together with production staff and test new processes in 3D. This type of planning is based on digitized factory data available in 3D. For several years now, the BMW Group has been digitally capturing its actual plant structures with special 3D scanners and high-resolution cameras to an accuracy of just a few millimeters. This provides a three-dimensional image, or scatter plot, of production areas and does away with the complex, digital reconstruction of structures and manual on-site recording. When planning future workstations or entire assembly halls, the BMW Group’s business units now combine existing data with a virtual library of shelves, mesh boxes, small load carriers and around 50 other particularly common operating resources. At its Production Academy, the BMW Group trains managers, production planners, process leaders and quality specialists on the principles of lean production. As key communicators, training participants then pass on this knowledge on the shop floor. For about 18 months now, AR goggles have been used in training sessions for engine assembly units. Visualizations guide participants through all process steps and give specific information. Participants can work at their own pace, determining the speed of the training via voice control. Three people can go through the AR training at the same time, after receiving quick guidelines from a trainer who supervises their progress. Previously, a trainer had to work with one person at a time, while with the new system this number has increased to three. Surveys among participants and evaluations of their learning success have shown that there are no differences in quality compared to conventional training courses. The engine assembly training can also be easily adapted to other screw joint processes—thanks to an authoring tool developed by the BMW Group for designing training programs. Setting up a new training program with this software is quick and easy: To complement real images, the relevant points of interest are determined at a regular PC and then set with the aid of AR goggles, and that’s all. In the course of 2019, this software will be made available to all interested staff via the self-service portal.

Checking a complex part weighing up to 25 tons, such as a press tool for the production of body parts, can take a lot of time. But speed is an issue: If the inspection takes place at Goods Receipt, an incompletely delivered tool can be returned even before being transferred to an interim storage site.

The process is simple: Staff at the Munich location of the BMW Group Toolmaking and Plant Engineering unit mount a standard tablet on a tripod. The built-in camera of the tablet produces an image of the tool. Then, an AR application superimposes this image with the CAD construction data of the tool ordered. Based on an average of 50 criteria, such as drill holes and other clear surface features, the staff can see whether all production specifications have been implemented. In the event of minor deviations, it may make sense to rework the tool on site—because the early detection of the issue leaves sufficient time before the tool has to be sent to the assembly area for completion with further components. Later this year, the toolmaking unit in Munich will completely convert the incoming goods inspection of delivered tools to the AR application. The tedious comparison between CAD data on the screen and the actual tool will then be a thing of the past. The BMW Group
also applies target/actual comparisons at its Munich plant. Using an AR application, specialists use pre-series vehicles to check the maturity of construction concepts and the correct installation position of components in these vehicles. The system makes it possible, for instance, to determine whether a side wall (fender) has the right dimensions, an exhaust system is installed in the correct position, or all the necessary parts have been mounted. Visualization of relevant CAD data only takes a few seconds. Data from several parts can be combined as desired and superimposed on the camera image of the tablet PC. An algorithm calculates the best fit that is the ideal position of individual components in relation to each other, and highlights important design features. The application developed jointly with the Fraunhofer Institute for Computer Graphics Research provides important information as to whether any adjustments, be it in vehicle design or manufacturing processes, are necessary before a model can go into series production (Edwards, 2019) (Fig. 15.3).

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