Chapter 7
How Digitization Affects Mobility and the Business Models of Automotive OEMs

Tim Kessler and Christoph Buck

Abstract Digitization has affected almost every industry during the past decade. The unprecedented pace at which digital technologies spread and penetrate society, individual life, and businesses specifically puts mature companies at risk. Within the automotive industry, digitization brings new players to the table, shifts the technological focus from physical to IT, enables customers to bring in their changing understanding of mobility, and makes them an ever more valuable source of information. Moreover, digitization affects the value creation process and emphasizes the importance of multilateral cross-company cooperations. This is also highlighted by the fact that most automotive companies currently lack the necessary competences to succeed in an increasingly software- and IT-dominated environment. The companies BMW, Porsche, and Tesla serve as examples for how car manufacturers deal with the digitization challenge and how they adapt their technological and service portfolio accordingly. We seek to enrich the understanding of how the rise of digital and networked technologies affects the business and business models of car manufacturers and provide suggestions on how they should react to turn these disruptive forces into business advantage. In this context we take a look at how automotive OEMs can integrate themselves into digital business models and mobility concepts of the future.

Keywords Automotive • Mobility • Digitization • Business model

7.1 Introduction

Private and business life are in the middle of a digital revolution. Industries like media, telecommunication, and the banking sector have largely changed over the last decade. Terms like "Web 2.0," "Internet of Things," or "Industry 4.0" are at the center of attention. Digitization shapes our industries in a way that a growing number of enterprises adopt business models and processes based on digital and computer

T. Kessler (✉) • C. Buck
University of Bayreuth, Universitätsstraße 30, 95447 Bayreuth, Germany
e-mail: tim.kessler@uni-bayreuth.de; christoph.buck@uni-bayreuth.de

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technology (Brennen & Kreiss, 2014). What makes digitization a challenge on its own is the fact that it "sets enormous change in motion" (Gimpel & Röglinger, 2015, p. 3). The unprecedented pace at which digital technologies spread and penetrate society, individual life, and businesses specifically puts mature companies at risk. The opportunities arising from digital technologies create new demands on side of the customer which require enhanced product and service attributes and foster digitization on their part. This means that cause-effect relations become blurry and induce complex interdependencies which trigger effects of enormous disruptive power. As these are very hard to foresee, it leaves companies with a high level of uncertainty related to future development (Gimpel & Röglinger, 2015).

The reason why we speak of a digitization megatrend is because it affects all industries and branches, and although not each business might inherently depend on digital technologies, there is none which can neglect the effects of digitization. As soon as companies do so, they put themselves in an operating situation with high risk to be outperformed by competitors (Berman, Marshall, & Leonelli, 2013). If companies want to survive in the digital economy, it is vital to develop strategies on how to meet the requirements imposed on them by changing business rules and changing consumer needs in a dynamic environment (Krings, Neely, & Acker, 2016). Consequently, firms have to reevaluate and to adapt their value propositions to the customer (Teece, 2010). Furthermore, new businesses emerge and existing business models have to be realigned. Those who succeed in effectively managing digital technologies are able to improve their customers' experience and engagement, to streamline their operations, and to create new lines of business and business models (Fitzgerald, Kruschwitz, Bonnet, & Welch, 2013).

As the need for continuous innovation is particularly prevalent in the automotive industry, original equipment manufacturers (OEMs) see themselves pressurized to react and adapt their businesses accordingly in order to remain competitive (Rese, Sänn, & Homfeldt, 2015). Hence, the focus of automotive business models shifts toward digital offerings, increasingly based on customer-centric needs. Digitally sold and delivered services in the automobile industry, such as multimodal travel services, remote vehicle health diagnostics, and driver health services, have a major impact on business processes and models (Berman et al., 2013). Investigating the impact of digitization on predominant business models reveals that "trends related to social media, mobile, big data and cloud computing are driving automobile manufactures to extend, revise, terminate, and create business models adding a digital layer upon the physical mobility infrastructure" (Hanelt, Piccinini, Gregory, Hildebrandt, & Kolbe, 2015, p. 1313).

The current mobility (r)evolution is linked to a shift in customer needs, legal regulations, and technological requirements triggered by technical progress. "We stand on the threshold of what can realistically be described as the largest and most important shift in transportation in a century" (Matus & Heck, 2015). Digitization teams up with the so-called sharing economy as a societal driver for change in the automotive sector, where the willingness to share gains growing attention with more and more OEMs entering the car-sharing market (Daimler's Car2Go, BMW's

DriveNow, Ford's GoDrive). Vehicle ownership is no longer the only possibility to make use of automotive mobility solutions. The way how people perceive and utilize mobility is changing and the subsequent challenges need to be met. Today's teenagers have managed to decouple the idea of freedom from the idea of car ownership. Snapchat and Facebook are solid substitutes for hanging at the mall with friends, and Uber, Lyft, RideWith, and BlaBlaCar are cheap and always-on ways to get around. This development is not lost on carmakers. The American dream of freedom through car ownership was the backbone of their business, and today it's taking a backseat to concepts like "mobility as a service," "cars on demand," and "data-driven infrastructure" (Dadich, 2015).

These challenges express the necessity of rethinking the way automotive players make sustainable profit and create a compelling value proposition. Traditional vehicle manufacturers will have to adapt, develop, and update business models and implement flexibility with new critical business competencies (Wedeniwski, 2015). Digital technologies are changing the products, brands, corporate communication activities, and the work environment. However, Hanelt et al. (2015) stated that "what is missing to date is an understanding of how digital transformation manifests itself in industries in which the core products are primarily physical […]." Therefore, there is a need for car manufacturers to gain a more in-depth understanding of how the rise of digital and networked technologies affects their business and how they should react.

Changes resulting from digitization are relevant for all car manufacturers and have to be analyzed systematically. In this paper we will outline the major challenges caused by digitization and changing consumer needs and help to answer the question how digitization impacts business models in the automotive sector. Furthermore, we take a look at how automotive OEMs can integrate themselves into digital business models and mobility concepts of the future. By providing company examples covering BMW, Porsche, and Tesla, the paper illustrates the current situation and highlights the disruption of the traditional business models of automotive OEMs. Understanding digitization helps a firm master digital change and answers the question of how to turn these disruptive forces into business advantage.

7.2 Digitization and Digital Transformation in the Automotive Industry

A company that thoughtfully manages the process of digital transformation will be able to turn questions arising from challenging issues related to digitization into chances for business value creation. Digital transformation generally hints at a management competence companies need to develop in order to align business models and processes with the application of IT systems and software which calls for a comprehensive digital transformation strategy (Gimpel & Röglinger, 2015). The need to adapt to changes triggered by digitization particularly concerns well-established companies that are not primarily structured around or operating

in the digital economy. This holds true for the automotive industry. Connectivity, for example, is not a recent development in the industry but well known to the OEMs for several years already. Yet it imposes a major challenge on automotive companies. This is mainly due to the fact that nontraditional players enter the market, and the unprecedented pace at which a need for connectivity is pushed forward by consumers.

7.2.1 How Digitization Affects Car Manufacturers

The first major challenge is that digitization opens established industry borders and lets powerful nontraditional players such as IT companies like Apple or Google enter the automotive ecosystem (Gimpel & Röglinger, 2015). This development enlarges market opportunities and therefore enforces competition. The varied setting of competitive structures triggers an emergence of new business models as well as new modes of innovation and leaves automotive companies with the challenge to serve unknown customer segments in redefined markets (Gao, Hensley, & Zielke, 2014). Keeping track of changing customer needs requires automotive companies to maintain a continuous dialogue with stakeholders in order to be able to develop answers to the current problems society is facing (BMW, 2015d). Delighting customers is the key to make the grade in the digital economy, and companies need to be well aware what constitutes the excitement factors of their product or service. As a result, enterprises can no longer build a competitive advantage only on product innovation but rather on great customer experience.

Another substantial challenge results from the fact that traditional preferences such as car ownership have been replaced by a more general need for mobility. This demand can take on many different forms which, for example, vary by region. Especially people living in urban areas seek alternatives to private car usage and create a demand for car-sharing services. Together with a multiplication in transportation modalities, this triggers a growing need for on-demand mobility. The challenge for automotive companies mainly results from building the ecosystem around this need (Siemssen & Hahn, 2015).

Autonomous driving is one of the major trends emerging from digitization which shapes the evolution of the automotive industry on a large scale. OEMs face difficulties in solving related issues on safety questions and insurance coverage and find themselves confronted by a limitation of potential market launches in this field as regulatory guidelines and liabilities prevail. However, semiautonomous driving is already possible, and all-autonomous driving is merely a matter of time (McHugh, 2015).

The reason why the automotive industry is particularly affected by the changes caused by digitization is that core elements of product functionality which are traditionally mechanical and performance-oriented features change in a sense that

expectations are increasingly geared toward computer- and communication-related functionality. One question arising from issues related to the growing importance of digital technologies is on how to reshape the traditional infrastructure to incorporate these new functionalities in the designing, manufacturing, and servicing processes (Gao et al., 2014). Automotive manufacturers might no longer have the competences for developing products and services on their own. Cooperations, e.g., with companies like Google, will be important in terms of being able to offer individual products at all.

7.2.2 Digitization and the Product

Digital technologies heavily impact passenger cars, resulting in fundamental changes to an OEM's products. Initiatives, strategic cooperations, or innovative technical solutions concerning the connected car are in the focus of international news. The Internet is ubiquitous as is the interconnection of technologies and products. This compels for a corresponding adaptation of the product and service offerings (Mikusz, Jud, & Schäfer, 2015).

Further trending topics result from the increasing intelligence and communication ability of vehicles. Car-2-x communication is on the rise and opens up completely new possibilities (Hanelt et al., 2015). The basic technologies necessary for these changes are already in place. Dynamic navigation and information transfer on the availability of parking lots could be based on car-2-car communication. Moreover, wearables and portable devices in the automotive industry and new forms of vehicle control, e.g., gesture control, eye tracking, haptics in automotive, natural language question answering, smart fabrics, and biometric driver identification, are gaining in importance (Berghaus & Back, 2015).

Another factor with rising significance concerning product-related changes is the prevalence of software in cars. While the average software life cycle currently accounts for 6–12 months, the life cycle of a passenger car accounts for approximately 6 years (Bharadwaj, El Sawy, Pavlou, & Venkatraman, 2013). As a result, cars are equipped with outdated software during the largest part of their life cycle. Over-the-air software updates, which are put in practice by some car manufacturers already today, are seen as the best possible way to solve this problem and will gain in importance (McKinsey & Company, 2015a).

Lastly, the current changes in the automotive industry encompass even more aspects than those mentioned above. Mobility services become more and more important and "many of the major brands are realizing that the future of their business is probably not in selling cars, but in providing mobility services" (Botsman, 2015). These services also build upon digital technologies. However, the resulting changes in the vehicles themselves are neglectable—changing business models are rather talked about in this context (Kane, Palmer, Phillips, Kiron, & Buckley, 2015; Kessler & Stephan, 2013).

7.2.3 Digitization and Value Creation

"In a digitally intensive world, firms operate in business ecosystems that are intricately intertwined such that digital business strategy cannot be conceived independently of the business ecosystem, alliances, partnerships, and competitors" (Bharadwaj et al., 2013, p. 474). The most important value chain partners for OEMs are the suppliers. While in 2002, the OEMs on average still created 35 % of the value in-house, their share fell to less than 18 % in 2015 (Brauchle, Kostron, & Schlesner, 2015). There is a trend of focusing on core competences and of increasingly outsourcing everything which does not fall into this category. Far-reaching technological change, such as digitization, further reinforces this tendency (Proff, Fojcik, & Kilian, 2015). We can expect to see an increasing number of multilateral cross-company cooperations. These will be based on digital networks that change the way traditional business processes function and make coordination and the exchange of data across multiple companies a critical success factor (Pagani, 2013).

7.2.4 Digitization and the Resource and Competence Base

As the product and the production of an OEM undergo dramatic changes, there also have to be corresponding adaptations in the resource and competence base of the firm. Digitization comes with a technological change in general that "leads to a decline in importance of the existing competencies in the old technology" (Proff et al., 2015, p. 24). New technologies gain in importance and hence competencies in these new areas have to be built up. If companies do not react appropriately, their value added deteriorates. OEMs currently experience blurring industry borders between the automotive and IT industry. In-vehicle information technology and consumer IT find their way into cars and electronics, and software development becomes a decisive competence of OEMs (Hanelt et al., 2015). Furthermore, electronics and sensors are enablers for information gathering from both cars and customers. Making use of big data becomes crucial and competences especially in this field gain in importance (Siemssen & Hahn, 2015).

7.3 Digitized Car Manufacturers in the Spotlight

BMW, Porsche, and Tesla Motors are forerunners in automotive digitization. We will briefly introduce their product and service offerings and will compare the companies' underlying business models especially with regard to electric mobility.

Founded in 2003, Tesla Motors is devoted to making electric cars and is making major car manufacturers rethink their strategy in the electric car market. Tesla's first model, the Roadster, hit the market in 2008. The model that has been making

headlines repeatedly, however, is the Model S, which Tesla launched in 2012. This premium electric sedan can drive 265 miles on a full battery charge and received several awards (Tesla Motors, 2015). What makes Tesla stand out in the electric car market is its charging technology and the infrastructure. The so-called super-charger stations constitute the most advanced electric charging infrastructure in the world. The Model X is Tesla's third Model and in 2017, the Tesla Model 3 is due to go on sale. It will be Tesla's first car aimed at the mass market, priced at $35,000 and offering 200 miles of range (Voelcker, 2015). A major step in terms of digitization at work was made by Tesla in late 2015 when they introduced the self-driving function via an over-the-air update (McHugh, 2015). Tesla provides many distinguished services and implements several highly innovative features into their cars.

BMW is arguably one of the most technologically advanced OEMs in the car industry. BMW's two electric cars are now entering their second year of production; however, both are in niche markets. The small battery-electric city car named i3 with a range of 81 miles isn't suited for driving long distances (Voelcker, 2015). BMW's other vehicle in their i-Project is the i8. The car is not all-electric but rather a plug-in hybrid. With a full 30 L fuel tank and a fully charged battery, it can drive at least 350 miles. The hybrid versions of BMW's cars are equipped with intelligent energy management software which autonomously decides when to use the electric power and when to use the gas powered engine (BMW, 2015b). This is a big step toward digitization and optimization of energy consumption. BMW introduced many technological feature like gesture control and a remote control via which the user can give the car commands to park itself, a parking assistant that helps with searching a parking lot and assists with parallel parking and a drive assistant that keeps a safe distance from other cars (BMW, 2015c, 2015d). BMW is the only manufacturer out of the three who officially provides car-sharing services. Together with the car rental company Sixt, they created the joint venture DriveNow in 2011, and now this venture operates successfully in several large European and American cities (Sixt, 2014).

Porsche was perhaps the one OEM most worried when the Tesla Model 2 arrived in late 2012. Not only did Tesla receive praise by buyers and media, but the German automotive press also complimented Tesla on its electric luxury sedan, suggesting it offered a combination of qualities no German carmaker would be able to offer (Voelcker, 2015). There is no electric car by Porsche out on the market just yet, but a "Mission E" pure electric concept was introduced at the Frankfurt Motor Show in September 2015, which is now officially going into production and to be launched at the end of the decade (Crothers, 2015). It will have 600 horse power, be capable of achieving 0–62 mph in less than 3.5 s and reach a range of more than 310 miles on a fully charged battery. It is also noteworthy that the battery should be recharged to 80 % within 15 min which would make it more than twice as powerful as Tesla's super-chargers (Davies, 2015). Porsche also has plenty of modern offerings that increase the comfort of the driver, including a Wi-Fi hotspot in the car, multi-touchscreen with similar interface as a smartphone, modern voice control, and navigation with 3D maps (Porsche, 2015b).

While Tesla is more daring when it comes to innovative ideas, it does not mean that BMW or Porsche cannot provide the same services. German manufacturers are just more careful and hesitant when it comes to changing some of the car features, but when they see that the demand for the features is there, they can provide quite quickly (Byron, 2015). With regard to the digitization and optimization of internal processes, the Germans have a huge head start. BMW maintains a balanced global value chain presence, with about half of the cars manufactured abroad (BMW, 2015a). Porsche also makes constant progress in this field; they constantly increase their production output and introduced new energy saving plans for their facilities (Porsche, 2015a). Overall, both companies enjoy well-developed supply chains and production techniques which give them the edge over new manufacturers like Tesla which still has a long way to go before it can challenge the automated supply chain and manufacturing of established manufacturers.

Still, the presented companies can be compared in other aspects, related to their technology as well as their performance in the markets. And while superior technology certainly contributes to an increase in market share, if the gap in technologies becomes negligible, brands will play a much bigger role in the consumers' choices. BMW and Porsche can still rely mostly on their names and are not forced to adapt to modern marketing approaches as swiftly as Tesla. It's also important to note that the big players in the automotive industry are still by and large generating massive profits by selling internal combustion engine cars. In contrast, Tesla's motivations for building electric cars are entirely different. Not only do they produce electric cars exclusively, but as a matter of fact, profits aren't even Tesla's primary mission (Musk, 2013).

It is not possible to pick a clear winner out of these three companies. They can all be considered as very innovative and as front-runners in the digitization trend within the automotive industry. Tesla has clearly the most compelling company presentation and modern customer interaction, but when it comes to digitization within the actual car, all three companies provide roughly the same services. The Germans have a stronger global presence and optimized manufacturing and delivery services. Moreover, BMW is currently the most daring competitor when it comes to the introduction of new business models. Therefore, all three companies are likely to successfully embrace digitization and remain fierce competitors in the future.

7.4 Implications

The question of how automotive companies can turn the disruptive forces of digitization into business advantage has different layers. Automotive manufacturers might no longer have the competences for developing products and services on their own. Cooperations, e.g., with companies like Google, will be important in terms of being able to offer individual products at all. In the future, automotive and IT industries will be forced to work closer together because of integrated

mobility concepts. The automotive industry needs to open up, share resources, and put more effort in IT talent acquisition (McKinsey & Company, 2015b). The interconnectedness of products and IT will grow in the future. This is the reason why IT is becoming a (co)shaper of future innovations and therefore maturing into a fundamental element of the value chain with its own independent services and business models (Brauchle et al., 2015). The connected car has developed into an app on wheels; the networks in digitized cars are employed to predict problems, distribute upgrades and even make new functions available. This requires the use of minimum standards, like process and interface standards, in order to improve intercompany cooperation. Here companies can follow the example of successful IT platforms like iOS or Android which might foster innovation (Koushik & Mehl, 2015).

Currently, the focus of car manufacturers regarding the business expertise in IT is on the coordination and administration of software development (Wedeniwski, 2015). In order to stay competitive, the next big issue for companies in the automotive sector will be the ability to quickly develop new software. They should follow the example of IT companies like Apple or Google, which update their operating systems every few weeks. That's why traditional OEMs should introduce a two-speed innovation model. As a result of this model, customers are allowed to benefit from small, quickly produced, and larger, less frequent updates. By offering customer-tailored additional features for a fee, the automotive industry could also generate a new revenue channel and integrate themselves into new digital business models that go beyond mobility services. The monetization would no longer end with the sale of the car or the after-sales services, but continue, e.g., by offering engine power upgrades on demand (McKinsey & Company, 2015b).

If the members of the automotive industry want to expand their business models toward the currently in vogue car-sharing offerings, they should always include the customers and their needs in their strategies and will have to find suitable business models to make this a sustainable and profitable market (Kessler & Brendel, 2016). The analysis of big data helps to understand the requirements and offering specific product configurations (Chakravarti, 2013). Hence, cybersecurity is another challenge for all companies in this context. Data and knowledge need to be protected from unauthorized access. One problem regarding those security standards are cultural and legal differences. Companies need to create solutions within an end-to-end digital operating model or by applying the required governance.

In order to respond to digitization, companies will also have to align their culture. The automotive industry needs to develop another mindset, in order to create innovations at the intersection of IT. Companies need to be more open referring to creativeness and the willingness to take risks and integrate such parameters into their existing structures (Brauchle et al., 2015).

Another important factor to keep in mind is that digitization is a moving target; the business models need to be adjusted over time. It's a relentless experience and opportunity for a repositioning of companies in a new era of competition and growth (Hirt & Willmot, 2014).

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