

Chapter 2

Industry Background

2.1 Introduction

This chapter aims to draw the picture of the automotive repair business in Germany in order to show the use cases and the requirements this work is based on.

It shall be pointed out in this chapter that this research is based exclusively on the German automotive industry and, in particular, on its repair business of passenger cars.

In the first part of this background chapter, the automotive industry in Germany is presented in the context of a European industry. Here, it is essential to understand that the German automotive sector provides major employment and requires highly skilled and educated personnel.

Next, the actual situation of the German automotive aftermarket and its value proposition is portrayed along with the services and people involved.

Finally, a résumé is taken regarding the situation in the German automotive repair market and the application of the Internet as a facilitator for virtual knowledge sharing.

2.2 Germany and its Automotive Industry

The German “*Automobilindustrie*” is considered the backbone of the German economy. German automotive original equipment manufacturers (OEMs) produce most of the passenger cars in Europe, and the industry is also Europe’s first automotive market. With a turnover of €384 billion, it generated 20 % of the total

industrial sector revenue¹ in 2014 (GTAI 2015) producing 5.6 million passenger cars, while, at the same time, there were 3.04 million new cars registered (20 % of European registrations).

Seventy-seven per cent of the cars produced in Germany are destined for export; thus, in 2014, the industry contributed to the world's greatest export surplus of \$285 billion (compared with China: \$150 billion). Indeed, every fifth car sold worldwide is of a German brand (Verband der Automobilindustrie 2014).

Directly connected to the export of vehicles, the automotive industry has 940 companies, employing around 800,000 people in Germany (Statista 2015c). Germany, being home to 43 engine and car assembly plants, hosts over one-third of Europe's vehicle production facilities.

In 2011, the German automotive industry, including the aftermarket, accounted for investments of €15.8 billion in research and development (R&D) in the industrial sector, which accounted for one-third of all R&D investments in Germany (Verband der Automobilindustrie 2012); in 2014, this investment had risen to €17.6 billion with 93 thousand R&D staff (GTAI 2015).

Of the major German car producers in 2014, the VW Group (including Audi and Porsche), Daimler, and BMW alone generated an accumulated turnover of €412 billion with a net profit of €32.6 billion in 2014.²

The German supplier industry is highly dependent on the manufacturers (Table 2.1). While ThyssenKrupp generates 14 % of turnover with the automotive business, other companies depend significantly on their business with the OEM. In addition, the number of global employees finding work in the related business units (BU) is significant.

The European Union is one of the biggest producers of passenger cars worldwide. The automotive industry, thus, is of central importance regarding the wealth of Europe's people. Not only is it a powerful employer for highly skilled individuals who provide the momentum for knowledge and innovation, but it is also Europe's greatest private investor in R&D and the major contributor to GDP and export surplus.

The European Commission has thus published three main targets regarding its automotive industry (European Commission 2015): "To strengthen the competitiveness of the automotive industry (1), To complete, adapt and simplify the Internal Market regulatory framework (2) [and] to promote globalization of the technical regulatory framework through UNECE." This research will contribute to these pan-European targets by offering insight into the service and repair sector of the automotive industry's aftermarket.

¹25.9 % of Germany's GDP was generated in the industrial sector (Statista 2015b).

²German GDP of 2809 billion € in 2014.

Table 2.1 Turnover and employment of German OEMs and German suppliers (2014)

OEM	Turnover (€ billion)			Total number of employees
VW Group ^a	202.458			592.586
Daimler AG	129.872			279.972
BMW AG	80.400			116.324
Supplier			Turnover automotive BU (€ billion)	Employees in automotive BU
Continental	34.505	189.168	34.505	189.168
Robert Bosch	39.782	290.183	23.471	171.208
ThyssenKrupp	39.782	156.856	5.520	47.057
ZF	18.400	71.402	10.787	63.548
Schaeffler	12.120	82.294	6.661	55.137
Mahle	9.942	63.541	9.942	82.294

Source Annual business reports 2014

^aincl. Porsche & AUDI

2.3 Germany's Automotive Aftermarket

Hecker et al. (2010) divide the German automotive industry into four turnover generating groups: new car sales (1), used car sales (2), insurance (3), and after-market (4).

The motor vehicle aftermarket is the secondary market of the automotive or heavy vehicle industry. While its primary market consists of the OEMs and the car producers (Table 2.1), the aftermarket centres on the value chain segments that come *after* vehicle production and sales. These segments incorporate the retailing and distribution of spare parts as well as services such as repair and vehicle diagnosis, remanufacturing, and the production of spare parts, chemicals, tools, equipment, and accessories.

The automotive aftermarket evolved out of the production of capital goods, such as light or heavy vehicles, and the need for the service and repair of these long-lasting consumption goods. Within the process of service and repair, spare parts or complimentary parts are sold and installed by professionally trained individuals. The aftermarket of the vehicle-producing industry is herewith defined as the market place for the distribution of services and/or vehicle parts for the repair of previously purchased passenger cars and capital or long-lasting consumption products.

In the automotive industry, it is not only the OEMs that offer spare parts. The spare-part producers who are not OEMs use their own sales channels in the independent aftermarket (IAM). This means that they deliver their goods and services to free³ repair shops, which again service and repair all vehicle brands and do not have a special focus on any particular OEM brand. The OEMs generally deliver to their

³Privately owned repair shops on the IAM.

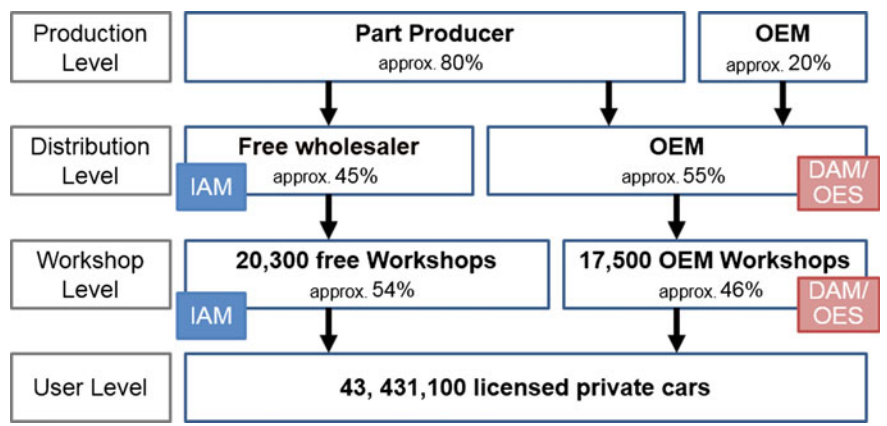


Fig. 2.1 Passenger car aftermarket with focus on spare-part production for repair (2014). *Source* Adapted and updated from Hecker et al. (2010)

dependent aftermarket (DAM) with own service stations, such as subsidiaries and OEM branded repair shops where, apart from their original spare parts, they also offer original equipment services (OES) (Fig. 2.1). Thus, the spare part and service suppliers focus the sales of their brands entirely on the IAM.

Aftermarket and Service concepts

Similarly, it is not only OEMs that offer their own service stations for their branded vehicles, e.g. Mercedes Benz Garage or VW workshops, but the IAM also has brought out *workshop concepts*, which are popular among vehicle owners whose vehicles are out of warranty or no longer have service contracts with an OEM. According to the Wolk Car Aftermarket Report (2012), there are around 420 workshop concepts present on the European IAM. These are partner systems managed by wholesalers, parts manufacturers (suppliers), or road assistance associations.⁴

Within the workshop concepts, there are specialized workshops; these account for 64 % of all workshops in Europe and 62 % in Germany (Wolk 2012). However, the density of outlets and repair shops in Germany is above average (Wolk 2012).

The Car Aftermarket Europe Report 2012 divides the types of concepts in European countries into six major groups.

⁴E.g. Bosch Car Service is a concept of a part manufacturer and supplier Robert Bosch Ltd.

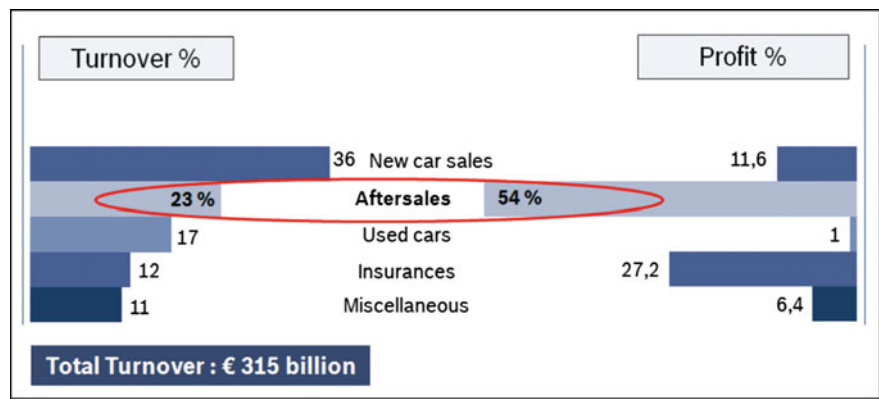


Fig. 2.2 Distribution of turnover and profit in Germany’s automotive industry w/o tier one suppliers. *Source* Adapted from Hecker et al. (2010)

Concept type	Number of concepts in Europe
Mechanical	153
Tire	107
Glass	61
Auto-centre	49
Body and paint	31
Fast fitter	23

Only 25 of these concepts can be found in over four European countries, and these have over 29,400 outlets (Wolk 2012, p. 2). The widest spread concept in Europe is the Bosch Car Service, with over 6000 partners and outlets throughout Europe.

Aftersales business (in both IAM and DAM) in the automotive industry has turned out to be the most profitable segment of the automotive industry; despite generating only 23 % of turnover, it still accounts for 54 % of profit (Fig. 2.2).

2.4 Value of Automotive Repair in Germany

According to the ACEA (2015), the European Automotive Manufacturers’ Association, and the German Kraftfahrtbundeamt (KBA, 2015), there were 43.9 million passenger cars registered in Germany in 2014 (Europe: 246 million), with an average age of 9 years.

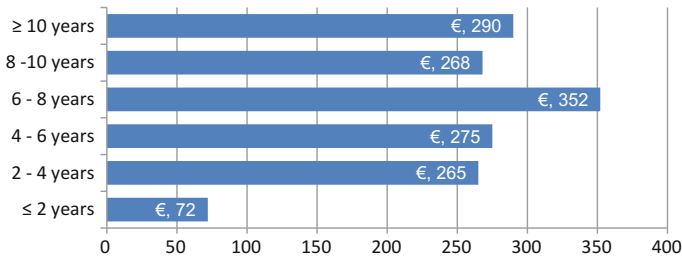


Fig. 2.3 Average repair cost in € according to vehicle age. *Source* DAT Report (2014)

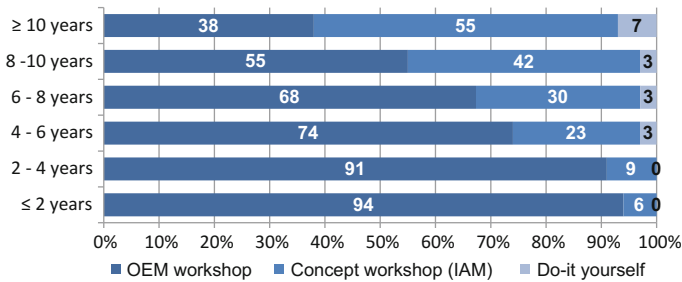


Fig. 2.4 Location for car repair according to vehicle age. *Source* DAT Report (2014)

The average repair expenses for the vehicles ranged from €72 for those under 2 years old to €352 for the 6–8-year-old ones (Fig. 2.3). Although the number of passenger cars according to age and quantity is almost equally distributed, with ≤5 years (35 %), 5–10 years (33 %), and >10 years (32 %) (ACEA 2009), the corresponding repair costs differ significantly.

Given that the average car is 9 years old and repair spending per year and per car amounts to €268, there are huge profits being generated in the area of automotive repair and diagnosis.

The legal vehicle warranty in Germany is for two years. This is the time span during which most vehicle owners take their car to the OEM's workshop for repair and service. After the time where warranty can be claimed has expired, car owners tend to look for a cheaper alternative, as the OEM service is assumed to be more costly than a service in an independent automotive repair shop of the IAM (Fig. 2.3). This means that the IAM market is a highly prosperous one and thus highly competitive as well. A high number of technical workshops in the European and German markets profit from repair services after the legal warranty period has expired (Fig. 2.4).

2.5 Vehicle Diagnosis and European Regulations

The automotive aftersales business is more than workshop concepts and the distribution of spare parts. In recent years, and with higher standardization and electrification of onboard security systems and components in the car, it has become difficult to reliably identify errors and blockages within the systems of a vehicle by trial and error, as the computerization of passenger cars has increased enormously.

Vehicle diagnosis—similar to diagnosis in the medical sense of the word—describes the exact attribution of diagnostic findings to errors in the electronic and electric components of vehicles. The word *diagnosis* sums up a wider range of technical measures and procedures, such as the analysis of defaults during vehicle repair, conducting quality control, and statistical analysis of vehicle features in the case of ambiguous functioning.

The complexity of the electrical systems in cars requires diagnostic tools, hardware, and the appropriate software that reads out the diagnostic trouble codes (DTC) saved within the electronic control units of a vehicle. However, above all, to conduct any repair, professional knowledge and expertise are required.

The abundance of data available about the vehicle hardware, as well as the depth of information the software provides, makes it difficult for any layperson to use these professional tools. This means that, currently, in order to conduct automotive repairs and apply diagnostic tools to their full range, the end-user (repair professional) needs to be well trained on the one hand, but, on the other hand, must also acquire the corresponding professional understanding, skills, experience, and knowledge about the electronic and mechanical systems of a vehicle.

As mentioned in the previous chapter, the European Commission has recognized the value of the automotive secondary market, as it is interested in setting standards regarding automotive repair and the diagnosis of exhaust and electrical systems.

German legislation started to promote the monitoring of the emission-related components of the vehicle to reduce fumes and exhausts in the late 1980s. In the ambit of the *Euro5* (EC No 715/2007) and *Euro6* regulations (EC No 595/2009) of the European Commission, car manufacturers are obliged not only to reduce and control vehicle emissions, which was the focus of previous regulations, but also to provide access to “vehicle and repair and maintenance information” (EC 2009, Art. 3 § 11). The term *vehicle repair and maintenance information* describes “all information required for diagnosis, servicing, inspection, periodic monitoring, repair, reprogramming or reinitialising or the remote diagnostic support of the vehicle and which the manufacturers provide for their authorized dealers and repairers, including all subsequent amendments and supplements to such information. This information includes all information required for fitting parts or equipment onto vehicles” (EU 2009, L188/5).

This regulation replaces the European block exemption (1400/2002), which the automotive industry was part of from 2002. Furthermore, with this directive, service handbooks, technical manuals and DTCs, and monitoring and test data among others have to be accessible by information-seeking end-users.

The essential content of this regulation, apart from the constant monitoring of emissions, is the “unrestricted access to vehicle repair information [...] which can be used to retrieve the technical information, and effective competition on the market for vehicle repair and maintenance information services are necessary to improve the functioning of the internal market, particularly as regards the free movements of goods, freedom of establishment and freedom to provide services” (EU 2009, L188, p. 3). Most of the information referred to is relevant to onboard diagnosis systems (OBD) “and their interaction with vehicle systems” (p. 3).

For the players in the automotive aftermarket, especially diagnostic tool producers, this regulation extends previously collected and gathered repair data⁵ due to the inclusion of original data about how to conduct repairs on a specific model and what are the corresponding spare parts to be used.

The access to vehicle repair information, however, does provide another challenge to the people who are directly affected in the field of automotive repair.

Despite the information about parts and components of vehicles being made available, only professionally experienced and knowledgeable mechanics have acquired the skills needed to make a successful repair possible by combining the information and data provided with personal expertise. Furthermore, with their skills and expertise, repair professionals can assess the proposed data, processes, and repairs, and might be able to even improve and optimize them. Capturing these improvements by social media provides an advantage not only to automotive aftermarket stakeholders, but also to the professional repair community, as innovative new approaches for repair can be spread quickly and further developed.

2.6 Offline-Knowledge Online: The Automotive Mechanic’s Asset

Experience and knowledge regarding repairs are acquired in the automotive repair shop environment, where the mechanic carries out the work of diagnosis and repair. The repair worker is the expert in the field of automotive diagnostics and possesses the expert knowledge that defines him or her in this professional setting.

The community of workshop employees consists of many expert mechanics who, within their community, bundle repair knowledge informally. As data and information alone are not practical for repair purposes, the mechanics play the crucial role of dealing, translating, and applying them in the context of their professional expertise. The mechanics’ professional experiences and knowledge consequently form an essential asset for car diagnostic and repair.

⁵Data on automotive repair can be generated onset or by help hotlines, online help documents, or fax, which are then processed into schemes for software. There are companies that collect and sell these data to the automotive aftermarket or OEM.

Information about applied repair and diagnostic knowledge is a high priority for OES to offer better service performance and improvements in test equipment, tools, and service training.

In addition, any OEM wanting to distribute the perfect vehicle aiming at customer satisfaction and market share has a high interest in obtaining repair data about their products.

Finally, the end-customer benefits, as he/she can rely on a constantly improving service and a possible reduction in repair costs due to optimization by transparency and the accessibility of the repair data of their own vehicle.

Due to changing demographics, firms have to use information about technological progress to benefit from the dispersed knowledge of their business to secure its long-term survival and to create a competitive advantage.

Consequently, virtual communities are created as means of gathering expert know-how and processing and retaining it for organizations (Amin and Roberts 2008, p. 359). To prevent the loss of this knowledge and to obtain a competitive knowledge advantage, it is important to gather and make the information and know-how of the mechanics accessible to key stakeholders.

In addition, to enhance customer satisfaction, organizations need to understand what triggers mechanics' intention to engage in the sharing of repair know-how in online forums. The creation of a social media tool alone, however, cannot be successful if the provider does not understand the motives that drive the target audience to engage in sharing their know-how.

Attaining acceptance of social media tools for daily work routines is the impulse for this research. The aim is to actively engage the target audience in sharing knowledge virtually, instead of losing extensive and practical repair expertise.

2.7 Social Media and Knowledge

Social communities and "networking [are] a necessary and effective method of boosting bridging and linking social capital thus enhancing social cohesion" (Gilchrist 2009, p. 22). Social communities on the Internet generate, acquire, and retain knowledge by interlinking physically dispersed people for a smoother and quicker exchange and transfer of information and knowledge. Using these applications means tacit information evolves into explicit knowledge (Nonaka 1994). Dreyfus and Dreyfus (1986) state that expert knowledge can never be fully captured in computer software due to the tacit and embodied elements. However, this tacit expert knowledge provides an essential basis that can be used to increase the pool of explicit knowledge, which again is the cornerstone for automated processes.

The feedback, information, and knowledge available on the Web regarding products and problem-solving are highly valuable, and organisations establish programmes to manage these intangible goods in order to minimize potential loss and to enhance their strategic resources.

Public repair networks of practice (NOP) have so far not been the focus of any big organization. To date, neither OEMs nor suppliers have been using the possibilities offered by social media in the context of building an exclusive NOP on the Internet.

Understanding the motivations for knowledge sharing on a social media site in the field of automotive repair will provide insights for both OEMs and suppliers to innovate and to gain a competitive advantage in dynamic environments (Kharabsheh 2007). This means that not just trends in and around the automotive diagnostic field, but also new information concerning the repair processes can be detected, accumulated, and combined, and new knowledge can be created.

Developing offline software for diagnostic and automotive repair into online tools could provide a wide range of advantages to the end user regarding knowledge sharing. Therefore, knowledge-based approaches should be implemented, as in today's knowledge-driven society this asset becomes vital for the development of a sustainable competitive advantage (Lin and Chen 2008; Kharabsheh 2007, De Carolis 2003). It is therefore essential to explore how to fill online platforms with people.

2.8 Social Media for Repair-Knowledge Management

Social media enhance the speed and flexibility with which people communicate and socialize online (Brown 2011). Brown argues that the speed and flexibility of social media components will increase and evolve into a dominant fixture through interconnectivity and virtual proximity. Vanderkaay (2010) holds that social media “reflects a yearning for human connection and self-expression by revealing doubts, asking questions and sharing lessons learned.” In addition, “Businesses must learn to harness real-time data as key signals that inform, a far more efficient feedback loop for product development, customer service, and resource allocation” (O'Reilly and Batelle 2011, p. 211). It is about the best practice of processing these raw diamonds of information and data polishing them into the form of substantial and sustainable knowledge and skills for the target group.

Over time, the exchange of information enriches its value of knowledge while building recognition (Vanderkaay 2010). Users who engage by contributing their own knowledge and expertise enrich the value of a forum. Thus, knowledge sharing can bring about enhanced effectiveness (Gupta and Govindarajan 2000) because, unlike other organisational assets, knowledge tends to increase when used or shared. Davenport and Prusak's (1998) view of it is that “ideas breed new ideas, and shared knowledge stays with the giver while it enriches the receiver ... only new knowledge resources—ideas—have unlimited potential for growth” (pp. 16–17).

To date, face-to-face knowledge exchange has always been regarded as a crucial point for the survival of a corporation (Wright and McMahan 1992). Indeed, Lin et al. (2009) have proved that knowledge sharing (KS) leads to a long-term competitive advantage.

Chen et al. (2010) like Davenport and Prusak (1998) understand knowledge management (KM) as the processes and mechanisms for acquiring and disseminating knowledge within an organization or from its external stakeholders. Effectively applied KM would, therefore, smooth the process of external knowledge exploitation (von Hippel 1994) and of internal knowledge sharing (Szulanski 1996) for the creation of new intellectual assets that are the foundation of competitive advantage (Ndlela and Du Toit 2001; Wenger and Snyder 2000; Spender 1996; Grant 1996).

The sharing of knowledge refers to a mechanism of acquiring and disseminating new or improved knowledge (Chen et al. 2010). In a virtual network, this means that knowledge is acquired and disseminated within the same space in a continuum.

In the automotive repair industry, the virtual space for repair would become a virtual “social” space where the acquisition and dissemination—sending and receiving of repair knowledge—take place simultaneously.

2.9 Chapter Conclusion

The approach discussed above focuses on exploring the determinants for sharing repair knowledge online. For researchers of social science, “group behaviour and the degree to which individuals participate and engage with the group are still difficult to understand” (Forman et al. 2008; in Kietzmann et al. 2012, p. 111).

Germany’s automotive industry is not only Germany’s most important GDP generator, but it also strongly contributes to Europe’s industrial power. Thus, as discussed previously, the know-how of the automotive aftermarket is of the greatest interest not only to Germany’s OEM and OES industry, but also to the EU, which is concerned with providing legislation and access to information about repairs to the general public. The knowledge contribution obtained by this research helps to comprehend a part of Europe’s most important industry. Furthermore, this contribution supports the further strengthening of the competitive advantage of the automotive industry by understanding the effectiveness of repair professionals whose knowledge so far is bound to the local physical or interpersonal social networks of the workshops.

This research will contribute by providing insight for different stakeholders into what are the predictors for social media acceptance within the target audience. Knowing such predictors could be of use for developing an ideal repair expert presence online or for devising proposals for action.

As displayed in this background chapter, the German marketplace appears an ideal place for research in this field, as Germany is home to the leading OEMs and thus home to numerous workshops throughout the country.

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