

# Experimental Research Study of the Impact of Distribution Channels of Particular Categories of Spare Parts on the Vehicle Repair Time

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In today's market reality, the information about the real time of the vehicle repair time has become an imperative of tremendous importance. In today's market of repair services, both the service providers and customers care about the most precise determination of this time. Thus, in terms of increasing market availability to other categories of spare parts than those original ones, the process of properly defining the implementation of the repair service is becoming more and more important. The article focuses on the issue of the influence of the distribution channels of particular categories of spare parts on the vehicle repair time. Considerations are based on author's simulations covering a comparative study of car repair periods depending on the applied category of spare parts. The purpose of the article is to answer the question, whether the applied category of spare parts in the process of the performed repair service affects the implementation of this service.

**Keywords:** spare parts, distribution channels, parts logistics, parts categories, repair time, repair service.

## 1. INTRODUCTION

As indicated by the available literature, the process of vehicle operation involves the need for periodic repairs and, consequently, the replacement and purchase of spare parts. At the outset, it is worth pointing out that as much as 80% of spare parts on the market come from independent manufacturers of parts, and only 20% are supplied directly from car manufacturers. Independent manufacturers of spare parts direct 43% of their production to the first assembly of vehicles. The remaining 37% of spare parts is intended for sale on the secondary market by independent distributors (Report 2015).

In the quest to define the determinants of logistical processes in terms of the distribution of particular categories of spare parts, we find a number of conceptual obstacles in the literature on the economics of transport and vehicle operation, which result in the lack of clear visibility of the correlation between the applied category of spare parts and the vehicle repair time (Wróblewski 2014). In the current market situation, the vehicle user in the repair process can use as many as six categories of replacement parts with different

quality and price parameters. Thus, in the context of the dynamic increase of market availability for various spare parts categories, the problem of analysing the impact of distribution channels on the vehicle repair time takes on a fundamental economic importance. Particularly for the processes of liquidation of communication damage and the car rental sector in Poland. As a consequence of the applicable regulations, a replacement car is available to the victim in the event of damage due to the civil liability insurance for the time of repair (Guidelines 2014).

Moreover, it is worth noting that the literature of the subject, both in the field of technical and economic sciences, has no such analyses and studies in the interdisciplinary sense, which further justifies the undertaking of this research subject in the context of academic considerations.

The presented approach has become the basis for the adoption of boundary conditions and methodology of conduct aimed at measuring the influence of the distribution channels of individual spare parts for the vehicle repair time by:

- Characterization of the distribution channels of individual spare parts available on the Polish automotive market.

- Analysis of the impact of the distribution channel on the car repair period from the strictly selected market segments.

In addition, the fundamental purpose of the article is to answer the question, whether the replacement part category applied in the process of the performed repair service affects the implementation time of this service.

## 2. CHARACTERISTICS OF THE DISTRIBUTION CHANNELS OF SPARE PARTS IN POLAND

Until the legal regulations in the form of sectoral exclusions become enforceable, no automotive regulation contained a clear definition of “the original part” (Council Regulation 2010). The term “original part” functioned on the basis of common routines and habits, and was reserved only for those items, which were purchased in the authorised network of the car manufacturer and in a packaging with his logo (Burnewicz 2005). Only such items could be sold and assembled in authorised service stations, and the use of others would mean the loss of warranty. In the international automotive jargon they were identified by the symbol “OE”, in English – *original Equipment*. According to the motor vehicle manufacturers, all Rother parts were “non-original parts”, and their use was allowed only outside the authorised network of the given car brand (Commission Regulation 2010). This “non-original” market sector was referred to as the *after-market* in the automotive jargon (Creutzig 2003). On the Polish automotive market for non-original parts, especially the so-called non-brand ones, the terms “replacement” or “fake” were also used (Lewicki 2010).

These regulatory changes of legal regulations and the continued demand and supply in this market have made it possible to use as many as six spare parts categories, with different quality and price parameters, in the present market reality in the vehicle repair process, meaning:

- Original spare parts most often labelled OE and O, Q1.
- Other original spare parts commonly labelled as OEM and Q, Q2.
- Non-original spare parts, i.e. alternatives, most often labelled as AM (and as Z, Q3).
- Spare parts of a comparable quality labelled as OEQ and as P, Q4.

- Regenerated parts, marked with an abbreviation WR.
- Used parts defined by the symbol U (Lewicki 2013).

Taking into account only the theoretical aspect of the considerations of spare parts categories, it can be mistakenly concluded that all the above categories have the same distribution channels. Meanwhile, the observations of market reality clearly show that for each category of parts, the logistical processes in this area are much differentiated.

Distribution of original spare parts primarily takes place through representatives of the brands of the given vehicle manufacturers. All authorised dealers of the given brand receive original spare parts with the “O” category from the national or regional warehouse, often within the daily or night deliveries. In most cases, individual vehicle manufacturers have one central warehouse in Poland, most often in the area of a highly developed transportation hub. Moreover, some manufacturers of vehicles, for example, Honda, Kia, Subaru supply Polish dealers from warehouses located outside Poland. In most cases, the delivery of “O” category spare parts from the central warehouse usually takes 1-3 days, while in some cases, deliveries are implemented in separate modes within the express 1 day delivery and within the normal 1 to 3 day mode. If the given part or component is not in the central warehouse supplying Polish dealers, this element is imported from a central warehouse of the given brand in Europe. In this case, the delivery time may be extended to 3-10 days. Any further sale and distribution of original parts with the “O” category from dealers to independent workshops is organized in a different way, which depends on, among others: local market habits, the degree of competition between the brand dealers in the given area of the business activity, the standards imposed on dealers by the general importer of the given brand.

As a result, the “O” category parts may be supplied by dealers with their own transport to independent workshops, but it is a non-standard solution. At this stage of considerations, it is worth emphasising that the use of German, Czech and Slovak dealers of particular vehicle brands in the logistical processes is a new trend in relations to this category of spare parts.

At this stage of considerations, we should mention the distribution channels of regenerated

parts, because the regeneration process in most cases concerns only the original parts. In this case, the distribution channel is more complex. In the first stage, the part has to be removed from the vehicle and reach the dealer of the given brand, and then through him to the manufacturer, who assesses the possibility of regeneration of the given element or component. The key factor in this logistic process is not only the delivery time between individual links from 1 week to 3 weeks), but also the regeneration process itself, which can be up to 21 days 8.

In contrast, the distribution of alternative spare parts of the “Q” and “P” categories is carried out by independent distributors in the multi-channel process. They can reach the final recipient from three fundamental sources: directly from the distributor (5%), through the shop (12%), through the workshop (83%) (Report 2015).

In most cases, the deliveries to workshops and stores are carried out through the distributor’s transport or by courier companies. If the given part is available in the given country, the delivery takes up to 2 days, in the absence of the part or component, the delivery time is extended and it often happens that the order is not carried out. The orders are made to the parts supplier by telephone or Internet. The observations made by the author indicate that distributors of alternative parts allocate large amounts of money for the development of own IT networks, including the premises of their customers. Developed software is designed to guarantee instant access to full information about the part you are looking for, e.g.: indicating the current status in all branches and warehouses in the country, price of the product, availability of replacements of other manufacturers, technical specifications of the given spare part and many other data (Research 2014).

The modern distribution channels of alternative parts of that times are web-based solutions for contacting the buyer with the part supplier. Among the most important functioning models of behaviour in today’s market we can list:

- The B2B model (Business to Business) is the name of relations taking place between the participants of the market (distributor and repair shop) implemented through the Internet. This solution covers the following area: preparation of the offer, preparation of the order, confirmation of the order, payment, execution of the transaction, issuance of documents related to the implementation of the transaction. In today’s market reality, this

model solution is owned by every “serious” distributor of alternative spare parts.

- The B2B model directly using platforms for calculating communication damage. This solution has already found its practical application in the European Union countries. This model allows the placement of orders for spare parts needed for the repair by bodyshops, directly after the repair calculations in expert systems, such as: Audatex®, Eurotax® or DAT®.
- B2C models (Business to Customer) are systems that offer services to individual customers. Examples of such solutions are online stores, information portals, auction sites. Typically, systems of this type operate on the basis of a database, which is installed on the server available through the Internet, and the individual customers using the system gain access to it from own personal computers. This solution is often used when buying tires, rims or spare parts, less often for parts for post-accidental repairs.
- Spare parts auctions for repairs financed by insurance companies. At this stage of considerations, it is worth noting that in 2015 the insurance companies in damage elimination processes implemented a solution called Audaparts® of the Audatex® company. This tool is an auction platform, where inquiries appear based on the cost estimates of post-accidental repairs carried out previously in the Audatex® system. The Audaparts® module provides access to inquiries to spare parts suppliers, allowing them to submit bids. The program automatically analyzes the submitted offers and selects proposals according to the criteria specified by the insurance company. In the course of the damage handling process with Audaparts®, spare parts are ordered according to the results of the auction results and they are delivered to the specific workshop. The insurance company will settle the damage directly with the repair shop, and not the customer.

Until recently, used parts in most cases were sold on exchanges, and the dismantling stations or scrap yards. As indicated by the available literature, the primary form of sales of this category of parts was the direct contact of the buyer with the seller. Observations made by the author show, however, that in today’s market environment, the online sites play the main role in

the used parts trade. The largest distributors of used parts on websites have thousands of descriptions with photos of various components and parts. However, the level of advancement of this form of sales makes it impossible to select used parts by catalogue numbers, which can be a serious problem, especially in case of components of the drive system or power supply. Usually, the buyer pays the cost of transportation of the spare part, and the delivery time depends on the implementation of this task by the courier company.

### 3. THE ANALYSIS OF THE IMPACT OF THE DISTRIBUTION CHANNEL OF SPARE PARTS ON THE VEHICLE REPAIR TIME

The complexity of the research subject matter and the diverse vehicle repair technology required an experimental approach. Therefore, the author in his simulations used the preconceived patterns of behaviour in order to show relevant relationships. Thus, the qualification or the cost analysis of the selected vehicle from the particular market segment will not be the subject of further considerations, and only the forecasted periods will be presented, the so-called expectations of individual categories of spare parts. In addition, for purposes of these simulations, it was simplified that in each analysed case, the technological vehicle repair time was determined individually on the basis of the calculation made for the selected expert program.

At the outset, in order to preserve the logical correctness and methodological value of the study, it was assumed that:

- The scope of research included one selected vehicle of the same manufacturer from four market segments A to D. These vehicles were characterised by high popularity among customers and the highest number of copies sold in 2017 on the Polish market. The manufacturer with a significant market share on the Polish VW sale market was selected for the analysis.
- Each selected vehicle was subject to the individual repair process provided for by the particular manufacturer.
- In order to estimate the technological repair time (this time is expressed in terms of unit and concerns body and paint works, specified by the vehicle manufacturer, and included in, e.g., estimation programs), a specialist expert

program called D.A.T. was used, supporting the numerical experiment with the accounting method.

- Considering the considerable scope of repairs carried out in the repair shop, it was assumed that the analysis will involve repair, including the replacement of parts, such as: bumper cover, right front light, right front fender, right shock absorber, engine compartment cover, full front reinforcement, radiator, alternator, right mirror.
- In order to illustrate these relationships, the waiting time for the parts was analysed in four basic variants: repair using original parts, alternative parts, non-original parts and regenerated parts.

The presented assumptions have become the basis for the adoption of boundary conditions and methodology of conduct aimed at dimensioning the influence of distribution channels on the total vehicle repair time by analysing the timeliness of order fulfilment of particular categories of spare parts on the example of individual passenger vehicles from the selected market segments.

From the point of view of the correctness of exploration and the possibility of capturing the necessary data, the results of the numerical experiment are presented in figures from 1 to 4.

The above summary simulation for the selected vehicle from segment A shows that the shortest delivery implementation time was observed in case of distribution of original parts, that is 2 days, and the longest in relation to regenerated parts – over 10 days. On this basis, it can be concluded that the fast execution time of the order in case of original parts is the result of a well-developed network of distribution channels and a refined logistic process by the manufacturer of the brand in relation to that particular model.

In addition, it is worth noting that in respect to alternative parts, the duration of the order is shorter than in case of used parts, which may indicate that, for this model, the availability of this category of parts on the market is limited and requires the supply in several customers. Meaning, not through one, but several different distribution channels.

Segment A

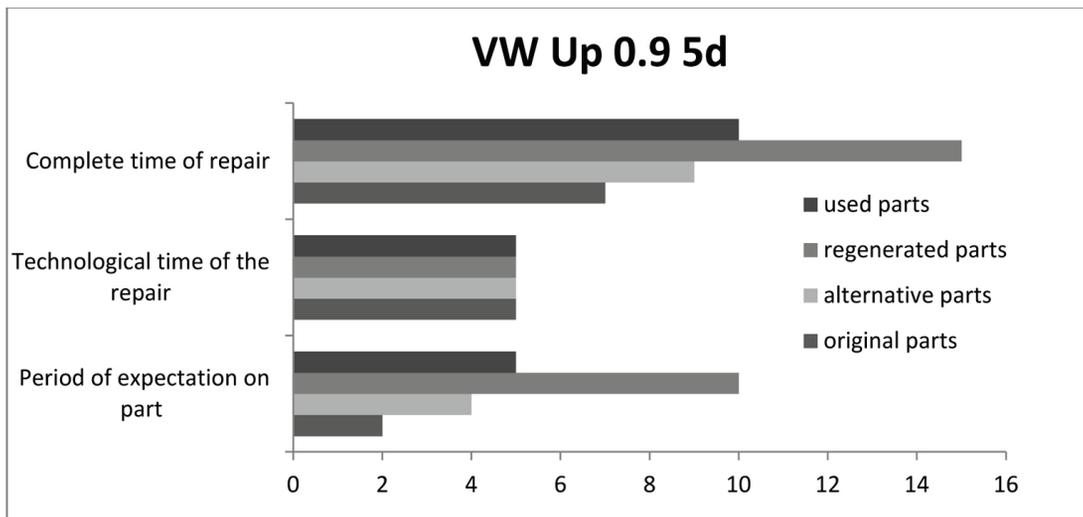


Fig. 1. The analysis of the impact of the spare parts used on the total repair time for a vehicle from segment A by days.

Source: Own study.

Segment B

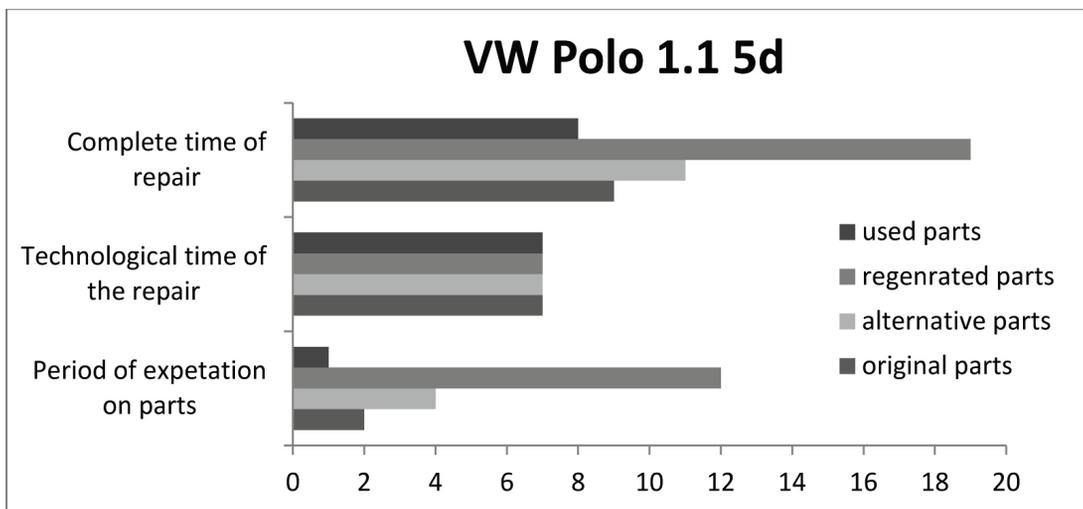


Fig. 2. The analysis of the impact of the applied used parts on the total repair time for a vehicle from segment B by days.

Source: Own study.

The above summary simulation for the selected vehicle from segment B shows that the shortest delivery implementation time was observed in case of the distribution of used parts, meaning 1 day, and the longest in case of regenerated parts – over 12 days. On this basis, it can be concluded that the fast execution time of the order can result not only from the high market availability of this category of spare parts for this particular vehicle, but also from the extensive distribution channels and the refined logistical process. In the case of original parts, the delivery time is extended by one day, which does not significantly affect the overall repair time of the vehicle.

In addition, it is worth noting that with respect to alternate parts, the order implementation time increases to four days, which directly leads to the extension of the total vehicle repair time. This finds its economic dimension in the form of a longer rental time of a replacement vehicle if the insurance company would insist on applying specifically these parts categories in the vehicle repair process.

Segment C

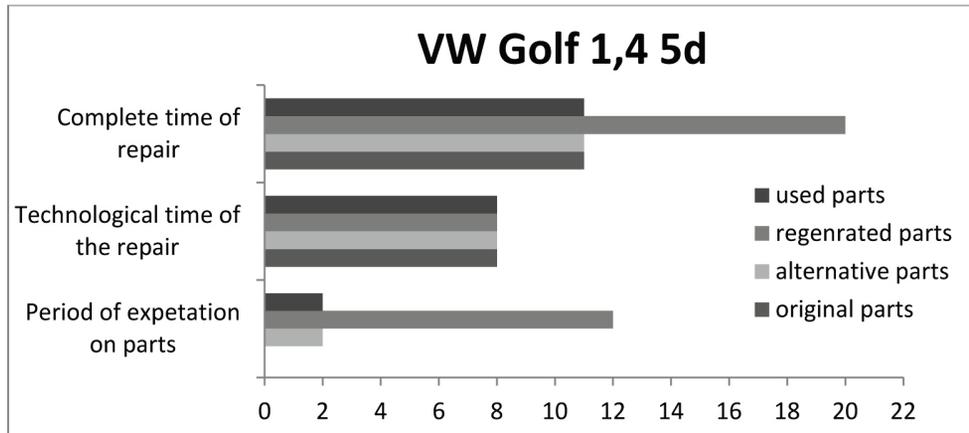


Fig. 3. The analysis of the impact of the used spare parts on the total repair time for a vehicle from segment C by days.

Source: Own study.

The above summary simulation for the selected vehicle from segment C shows that the shortest delivery time was observed for the original, alternative and used parts, and it amounts to 2 days. The longest time in case of regenerated parts was over 12 days. It is worth noting that for this particular model, the delivery time of these particular parts categories is the same. According to the author of the research, the popularity of this particular model in Poland affects this state of affairs, which is directly expressed in the logistic process in terms of the distribution of these categories of spare parts. Each manufacturer of the particular category wants to deliver his product as fast as possible using his distribution channels, in order to compete with other distributors. In particular for the dealer of the given brand, who only has original parts in his market offer.

The above summary simulation for the selected vehicle from segment C shows that the shortest delivery time was observed in the distribution of original parts, i.e. 3 days, and the longest in case of regenerated parts – 18 days. Thus, it can be concluded that the fast execution of the order may result not only from the high market availability of this category of spare parts for that particular vehicle, but also from the effective distribution channel and refined logistical process. In the case of alternative parts, the duration of this order is much longer. According to the author of the research, the determinant in the form of a limited market availability to this category of parts may affect this state of affairs, which leads to the extension of the distribution time, e.g., the analysis of their availability degree, searching or identification of specific parts.

Segment D

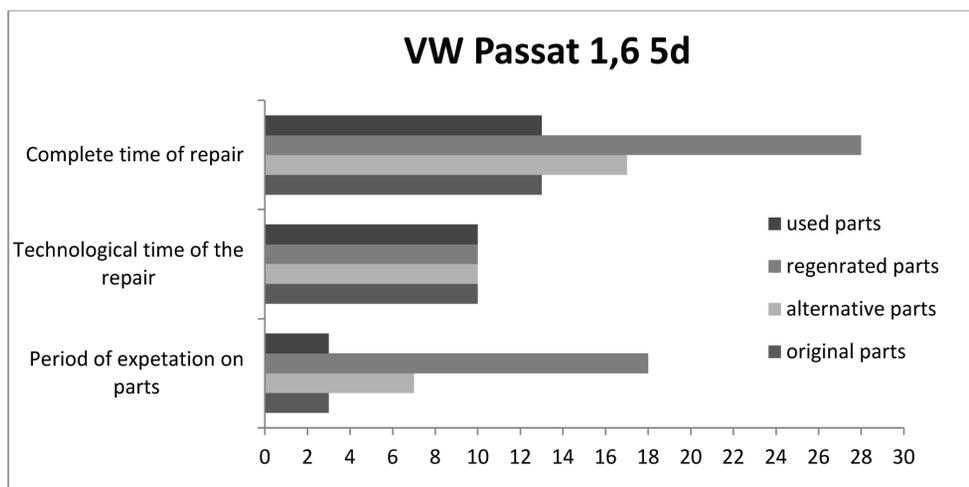


Fig. 4. The analysis of the impact of the used spare parts on the total repair tome of a vehicle from segment D by days.

Source: Own study.

It is worth noting that with respect to alternative parts, the time takes to complete the order increases additionally up to four days, which leads directly to the extension of the total vehicle repair time and may find its economic dimension in the form of a longer rental time of the replacement vehicle. In case when the insurance company insist on applying this category of parts in the repair process.

#### 4. SUMMARY AND CONCLUSIONS

The available reports and studies clearly indicate that Poland has become a major manufacturer of spare parts with different quality and price parameters in the European Union (Report 2015). It is worth noting that more than half of the spare parts manufactured in Poland is intended for export. In most cases, this market is made up of independent distributors, who offer alternative parts for most passenger cars used on the Polish roads in (Research 2014). The Internet and the above behaviour models have become the basic distribution channel for these parts categories. However, in the coming years, the insurance industry will determine the evolution of changes in terms of logistics and distribution channels of the categories of particular spare parts. The observations made of the market reality clearly show that the trend of using categories other than the original ones is becoming more and more visible on the market of repair services financed by insurance companies. As mentioned in the introduction, both for the service provider and the customer, the information about the actual time of vehicle repair has become an imperative of great importance (Jastrzębska 2014). On the one hand, creating potential benefits in terms of cost reduction of repairs (Wicher 2005). However, on the other hand, creating foundations for discussion, whether the increase in competitiveness in the form of the emergence of other categories of spare parts on the market has in reality led to the extension of the vehicle repair time, as the author stated in his own research.

By analysing the simulation results presented in the figures of the impact of the applied spare parts on the total repair time of vehicles from segment A-D, it was found that:

- Each category of spare parts has a different distribution channel. Distribution of original spare parts primarily takes place through vehicle manufacturers' representatives. While the distribution of alternative spare parts of the

“Q” and “P” categories is carried out through independent distributors in the multi-channel process. The modern distribution channels of alternative parts of that times are solutions using web-based solutions for contacting the buyer with the parts supplier.

- The selection of a particular spare parts category in the repair process has a direct effect on the total repair time.
- The fastest delivery time and the most efficient distribution channel was found for the original parts.
- The longest delivery time was observed for the regenerated parts.
- With respect to alternative parts, the order implementation time is much longer than for the original parts, which increases the rental time of the replacement time.
- Although the analysis concerned the same manufacturer and the same category of parts, there are disproportions in the implementation period of particular orders in case of individual market segments.
- For each of the analysed distribution channels of spare parts, there are different periods of implementation.
- The higher the market segment, to which the given model is assigned, the longer the technological vehicle repair time.

Summing up, the attempt undertaken by the author of presenting the experimental study of the impact of distribution channels of particular spare parts on the vehicle repair time does not fully exhaust the essence of the problem, and it is merely an attempt to signal the complexity of the studied problem, and certainly required further research. Its aim will be to understand the market laws governing this specific automotive service sector.

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