

Quality Management - a Factor for Improving Sustainability in the Automotive Industry

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Abstract

Due to the importance of the automotive industry in the world economy and its impact on the environment, the implementation of sustainable development measures in this industry has become mandatory. This paper wants to emphasize the link between the implementation of quality management and the sustainable development of this industry but also to highlight the opinions of car users in Romania related to this issue. In this sense, the authors conducted a quantitative marketing research, collecting data based on a questionnaire. The research results show that most respondents are aware of the need to protect the environment and the involvement of the automotive industry in this regard.

Key words: quality management, sustainability, automotive industry, marketing research

J.E.L. classification: L62, M11, M31, Q56

1. Introduction

The level of quality of a product is given by the extent to which it meets the stated needs or expectations, which are generally implicit or mandatory. These expectations have expanded in recent years, with the emergence of climate change, which have brought into question the need for sustainable development. The EU car industry has a significant share of its GDP and, over the last decade, has aligned itself with trends towards environmentally friendly products that are in line with the Union's sustainability policy. This industry is considered the engine of Europe, due to the following aspects presented by the Association of Romanian Car Manufacturers (ACAROM, 2020).

Vehicles produced in Europe are the cleanest, safest and quietest vehicles in the world. Europe ranks first among the world's regions in terms of eco-production, with a decrease in the amount of water and energy used to produce a vehicle, as well as a reduction in CO₂ emissions and waste from vehicle production. The turnover generated by the automotive sector represents 6.8% of the total EU GDP. The automotive industry generates positive effects in most economic sectors, supporting a wide supply chain, while generating a wide range of profitable activities. 13.8 million employees (6.1% of the total EU workforce) work in this sector. Vehicle production is a strategic EU industry, 19.2 million cars, light commercial vehicles, trucks and buses are produced every year. The European car industry is a global player, offering quality products "Made in Europe", generating a trade surplus of 84.4 billion Euros annually. The automotive industry is the largest private investor in Europe in the field of R&D with more than 57.4 billion Euros annual investments. In 2018, half of all patents worldwide were registered by the EU car industry. (ACAROM, 2020).

Due to the importance of this industry and its involvement in the trend of sustainable development of society, the authors have created a paper to present the link between the implementation of quality management and the achievement of sustainability objectives in the

automotive industry. Also, in order to highlight the opinions of car users regarding sustainability in the automotive industry, the authors conducted a quantitative marketing research. The non-random sampling method was used, and the data collection technique was called CAWI - Computer Assisted Web Interviewing.

The results of the research show that most respondents take into account the degree of pollution when buying a car and that they believe that manufacturers in this industry need to be more involved in protecting the environment and resources. Although the research has limits on the number of respondents, its results can be the basis for new research, at a broader level, to better highlight how the car industry can get involved in sustainable development.

2. Literature review

Quality was originally understood as a characteristic of products that indicates that the purchased product is durable and serves the purpose for which it was created. However, the concept of quality has gradually changed. Currently, quality is defined according to the ISO 9000: 2015 standard as: "the extent to which a set of intrinsic characteristics meet the requirements" (Stoican et al, 2013), the latter being understood as declared needs or expectations, in generally implicit or mandatory.

In order to achieve quality products and services that meet or even exceed customer expectations, it is necessary to implement an efficient quality management system at the organization level, quality management referring to "coordinated activities to guide and control an organization in terms of regarding the quality" (Drăgulănescu, Drăgulănescu 2003).

According to Nistoreanu et al (2013), the management of companies has an essential role in quality assurance, it has the responsibility to develop quality policy, to define the responsibilities of each department, to document and analyze the quality management system. The quality policy must be integrated into the general policy of the organization and pursue both objectives regarding the quality of products and services, as well as objectives regarding the quality of the company's processes as a whole. When developing the quality policy, the expectations of all stakeholders (customers, investors, employees, suppliers) will be taken into account.

International quality standards require the structuring of documents underlying quality management systems on three levels: quality manual, quality management system procedures, work instructions along with other documents of the quality management system.

The quality management system documentation is particularly important for controlling all company processes, facilitating their monitoring and determining results so as to identify necessary corrective action or improvement (Madar, Neacșu 2014). The quality manual includes the description of the company's quality management system, communicates to the staff the management's commitment regarding quality; ensures the coherence of the quality policy with the general enterprise policy; it is used as a basis for continuous improvement; facilitates communication between the organization's departments as well as between employees and customers, contributes to increasing customer trust due to the existence of a document-based system, is the basis for internal audits of the quality management system.

The level of quality of a product is given by the extent to which it meets the stated needs or expectations, which are generally implicit or mandatory. These expectations have expanded in recent years, with the emergence of climate change, which have brought into question the need for sustainable development.

Current debates on sustainable development focus on the high volume of greenhouse gases, which affect the environment and therefore people. The Intergovernmental Panel on Climate Change (IPCC) announced in its 2018 special report on global warming that if the level of greenhouse gases is not reduced by 2030, the environment will be irreversibly affected, reaching the disappearance of fragile ecosystems and the series of crises that will affect vulnerable people (IPCC, 2018).

As a result of these statements, several global environmental protests were organized, in which participants called on governments to take action for sustainable development. As far as the car industry is concerned, an increasing number of people have become interested in buying a car that does not affect the environment, the low volume of CO₂ emissions thus becoming an increasingly

common requirement of customers. On the other hand, a considerable number of states and political organizations have announced and / or implemented measures to reduce the volume of greenhouse gases. The attitude of society and political organizations has led to the extension of the definition of quality with a new feature, that of sustainability.

3. Description of the car market

The car industry is characterized by dynamism and fierce competition, these characteristics being well known not only to the three companies ranked first in the ranking of car companies with the strongest global brand (Toyota, Mercedes and BMW - Forbes (<https://www.forbes.com>) but also to other companies that want to operate in this market.

In the automotive industry, quality is one of the properties that give companies a key competitive advantage. Quality means both the quality of the product and the benefits brought to the company and the company itself as a result of its activity.

According to the International Organization of Motor Vehicle Manufacturers, known as the International Organization of Automobile Manufacturers (OICA, 2019), if the automotive industry were a state, it would be the sixth largest economy in the world. The automotive industry is also a major innovator, with its annual investment in research, development and production amounting to over 84 billion euros. The automotive industry and car users support the state budget, with their global contributions amounting to more than 400 billion euros (AIAG, 2020).

Although this industry is and continues to be strong, in 2019 there was a decrease in the number of vehicles produced and sold. This decrease leads to increased competition within the industry (table no. 1).

Table no. 1. Vehicle production in 2019 compared to 2018

State	Number of vehicles 2019	Change compared to 2018 (%)
China	25.720.665	-7.5
USA	10.880.019	-3.7
Japan	9.684.298	-0.5
Germany	4.661.328	-9
India	4.516.017	-12.2
Mexico	3.986.794	-2,8
South Korea	3.950.617	-1,9
Brazil	2.944.988	+2,2
Spain	2.822.355	+0.1
France	2.202.460	-2.9
Total	91.786.861	-5.2

Source: <http://www.oica.net>

Electrification of engines, as well as other factors such as: autonomous technology, connectivity, digitization along the production chain seem to lead in the not too distant future to fundamental transformations of how the entire automotive ecosystem works - so not just the industry itself, but also the market and the relationship between users and the car. The risk of such scenarios has already pushed manufacturers and suppliers to invest heavily in these technologies, in order to at least maintain their current position in the European and foreign markets. All this with the help of the European authorities, who appreciate that the car industry is about to enter a new era due to environmental regulations and technological advancement. Even if in the long run there is some consensus that radical change is inevitable, the uncertainty is very high when it comes to the pace and manner in which this transition will take place.

At present, the Romanian car industry is characterized by the presence of foreign capital infusions and by the existence of local companies. Automotive manufacturers are attracted in Romania by low labor costs, experience in the automotive field, but also the potential of Romanians in the area of research and development.

In 2019, Romania produced components and cars worth about 30 billion euros. Regarding the sales of vehicles, they amounted to over 200,000 units in the mentioned year, the figure representing a record for the last 11 years (Alec, 2020).

The automotive industry in Romania consists of two large car manufacturers and over 400 manufacturers of automotive components. The car manufacturers are Dacia-Renault and Ford and the most important car parts manufacturers: Autoliv, Bosch, Continental, Delphi, Draxlmaier, Fujikura, Michelin, Preh, Pirelli, Schaeffler. The main source countries of FDI in the automotive field are: Germany, France, Italy, Sweden, USA.

The production of components for automobiles represents the segment with the most important growth of the automotive industry in Romania, growth stimulated by the dynamics currently registered by this industry. However, the entry of these companies producing car components did not coincide with the opening of the country to the market economy, the companies starting to settle in Romania after more than 10 years from the change of the economic and political regime.

Starting with the year 2000, the companies producing components from the automotive industry started to make their presence felt in the Romanian space, especially in the western part of the country and in the cities with an industrial tradition in the automotive sector.

Most of the producers appeared in the Romanian space through Greenfield investments, having the possibility to choose the location and to implement from a technological point of view the necessary production lines. The production of these companies operates mostly on demand in the form of orders from business partners, thus avoiding being suffocated by stocks.

4. Quality management and sustainability in the automotive field

Car manufacturers have been concerned with quality since ancient times. The first company in the automotive industry to be interested in ensuring high product quality was Toyota Motor Corporation, which decided in the early 1960s to implement total quality control (TQC) activities to address quality issues early and to prevent their occurrence (Toyota Code of Conduct, 2018). Toyota has a global reputation for quality and reliability, a high level of technology used and numerous awards (Truck of Year 2000, Japanese Deming Award 1965, etc.) for the quality of its products. The popularity of total quality management (TQM) has grown since the 1980s, and its concepts have been implemented by other car companies such as Ford Motor Company, General Motors.

Another company in the automotive industry that has been concerned with the quality of its products is Volkswagen (VW). In terms of quality management, Volkswagen has signed an agreement with suppliers from the VDA (German Association of the Automotive Industry) to protect the common quality in the German automotive industry, Volkswagen being one of the largest global automotive companies in terms of the number of vehicles sold annually. To support its customers, the company provides financial services, including leasing services and fleet management.

The fact that Volkswagen has managed to stay in the top of the world's car manufacturers is due to the high quality of its products, the stronger level of development orientation, the attention it pays to continuous employee training, focus on the supply chain and the implementation of sustainable strategies in the process of eliminating errors. The existence of clear evaluations and rules for manufacturers and suppliers facilitates and improves cooperation in all phases of product development and manufacturing (VDA/ QMC, 2020).

Another example is represented by the Dacia Company. The Dacia Quality Management System was certified for the first time in 1998, in accordance with ISO 9001, 1994 version (Trandafir, 2015). Dacia constantly implements a Quality approach based on continuous progress. This requires a high-quality Quality Management System, verified during certification audits. The objective of Automobile Dacia itself is not only to produce cars, but also to respond more and more to the tastes and needs of customers. Thus, the company aims to produce and sell reliable, modern and affordable cars, respecting exactly the quality standards.

The quality of products and services plays an important role in maintaining customer satisfaction. Buyers are satisfied and tend to remain loyal to a brand when their expectations of a particular product and / or service are met or even exceeded. The response time of a company to a

buyer's request, the reliability and the services offered by it determine the quality, as it is perceived by the customer in the whole experience of purchasing the product. Therefore, companies in the automotive industry (Toyota, Volkswagen Group) have long understood that quality management is an essential tool in the relationship with buyers and suppliers, to meet the expectations of the former.

The carbon emissions scandal of 2015/2016, in which Volkswagen was involved, drew the attention of governments and society to the need for sustainability to be a major factor in the development of a vehicle. Not only did the scandal put Volkswagen in an unfavorable light, but there were questions about the rest of the German car companies and beyond. As a result of this scandal, companies in the automotive sector have identified a property in sustainability that could increase their competitive advantage by attracting a segment of customers interested in protecting the environment.

The main factors that can determine a sustainable product development are the political actors, by adopting appropriate laws, customers and competition. More and more customers are now interested in buying a car that does not affect the environment. Competitors in the global market are oriented according to customer preferences and improve their products (through recycling techniques, new types of cars, such as electric, etc.), realizing that if a company wants to stay in the market, it must pay special attention customers and competitors.

Sustainability has become a pillar of research and development not only in Europe but also on other continents. An article published by Henderson (2011) outlined how Ford Australia aims to create hybrid cars that require up to 25% less fossil fuels. The main constituent of greenhouse gases is carbon dioxide (CO₂), emitted in large quantities by automobiles, the transport sector being one of the main factors of air pollution by greenhouse gas emissions (Krishnaswami et al, 2013) .

A study published by Xiaoxi Zhu et al (2019) shows that in China, the number of people interested in purchasing an electric vehicle is increasing. On the other hand, the Chinese government is set to increase their numbers even further by launching a program to support producers. In China, investments are currently being made in the research and development of a successful electric car.

Günther et al (2015) state that electric cars are perceived as a key technology in the industry, which can make a significant contribution to sustainable development, reducing air pollution and creating jobs with a positive impact on society.

Qinyu Qiao et al (2019) show that the level of greenhouse gas emissions involved in the production of an electric car is higher than that involved in the production of a car powered by fossil fuels (10.5 tons of carbon dioxide / vehicle , respectively 13 tons of carbon dioxide / vehicle). However, the level of emissions when using an electric vehicle is much lower than that of a classic car. It cannot be called an exact percentage, as it varies from country to country, depending on the percentage of fossil fuels from which electricity was produced.

Stoychevaa et al (2018) show that in an industry like automobiles, where companies rely heavily on attracting customers to withstand competition, customers' desire for sustainable development cannot be ignored.

Given this reality, another concept that is gaining more and more attention from the authorities, society and companies is the circular economy. With the help of the circular economy, it is desired to achieve a balance between economic, environmental and social interests (Kristensen et al, 2020).

The circular economy involves overcoming the traditional economic model, in which used products are thrown away, being proposed to recycle and reuse them as a way to protect the environment (Urbinati et al, 2017).

Obstacles to the rapid implementation of the principles of the circular economy within this industry are the lack of financial resources needed to develop recycling technologies and purchase related equipment. Despite these obstacles, however, significant progress can be made towards sustainable development, both in terms of the product (through electric cars) and in terms of recycling and reuse of materials.

An example of this is the Peugeot Company. The company works to minimize the impact of cars on the environment as much as possible, so from the design phase until the end of the life of vehicles, Peugeot teams make every effort to achieve this.

The Peugeot network is committed to meeting several major criteria in terms of environmental management:

- Sorting and collection of vehicle waste generated as a result of maintenance and repair activities carried out by the service network through authorized bodies
- Compliance by national and European regulations by the network
- Total traceability of vehicle waste until recycling
- The sorting and collection of waste generated as a result of maintenance and repair activities is performed in accordance with the management methods of the discarded products of the brand.

Also, the Group's objective is to become a leader in this field, with an average of 30% environmentally friendly materials per vehicle (recycled metals, polymers based on environmentally friendly materials).

Peugeot is not the only company in this field that wants to achieve a sustainable activity. Another example is BMW, which is making a sustained effort to build products that are truly sustainable beyond the user experience. The BMW Group and, in particular, the BMW i are pioneers in sustainability and efficiency not only in terms of the amount of greenhouse gas emissions produced by the use of cars, but also in terms of emissions throughout the life cycle of the product - from production to recycling (Press Club Romania 2017).

5. Research methodology

In order to identify the importance that both buyers and car manufacturers attach to environmental pollution and the implementation of sustainability measures in this industry, the authors conducted a quantitative marketing research.

Research objectives:

- Determining the importance that respondents attach to the degree of pollution of the vehicle
- Determining the degree to which the automotive industry impacts the environment
- Outlining an image of the future of the automotive industry
- Determining respondents' perceptions of sustainability

The sampling method used was non-random. The data collection technique called CAWI - Computer Assisted Web Interviewing was used, a method by which the questionnaire is displayed on a web page, the respondent filling in the answers directly in the browser. The period in which this study was conducted is February 2020 - April 2020.

Data collection was based on a questionnaire answered by 102 people. After the first question (respectively if they own a car) the sample was 95 people. The questionnaire was structured in two parts. The first part contains questions about the car industry, both in terms of quality management and sustainability, and the second part contains questions about the demographic characteristics of respondents (gender, age, income, education, residence).

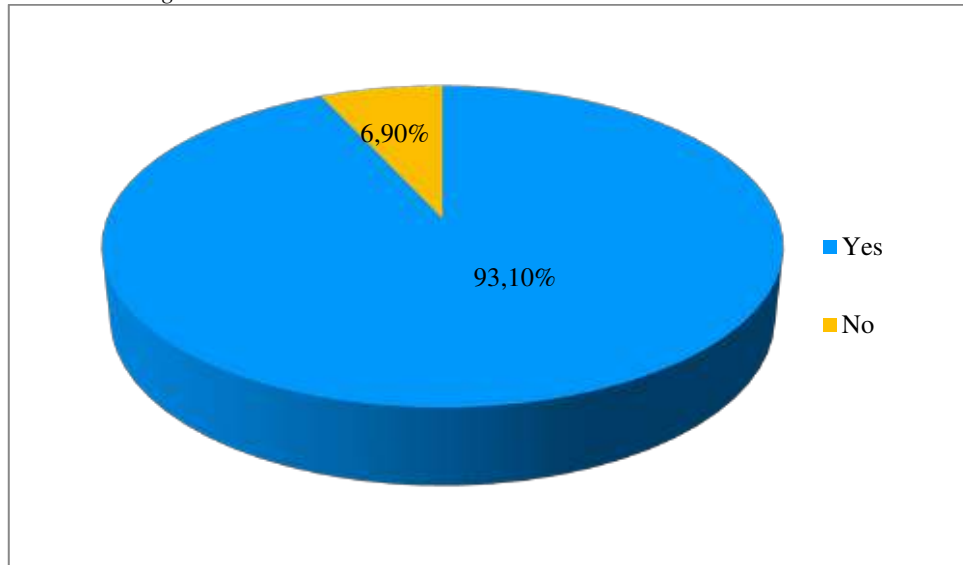
The structure of the sample in terms of gender of respondents shows that 54.7% are male and 45.3% are female. Regarding the distribution by age, the age range in which most respondents fall is 18-25 years, in second place was the range 26-35 years with a percentage of 34.7%, in the next place was the range aged 36-50 years with a percentage of 25.3%. By origin 58.9% of respondents come from urban areas and 41.1% from rural areas. In terms of monthly net income, most of the respondents are in the range of 2000-3500 lei, respectively 52.6%, and fewer in the range of "over 5000 lei", respectively 11.6%.

6. Findings

The first question of the questionnaire divides the respondents into two distinct categories. The first category is represented by those who own a car (respectively 93.1%) and the second category by respondents who do not own a car (Figure no. 1). This question has the role of a filter question, the respondents who do not own a car can only answer this question, without going through the rest of the questionnaire.

Most of those surveyed own the Volkswagen brand (33.7%), followed by those who own the Dacia and Mercedes brands.

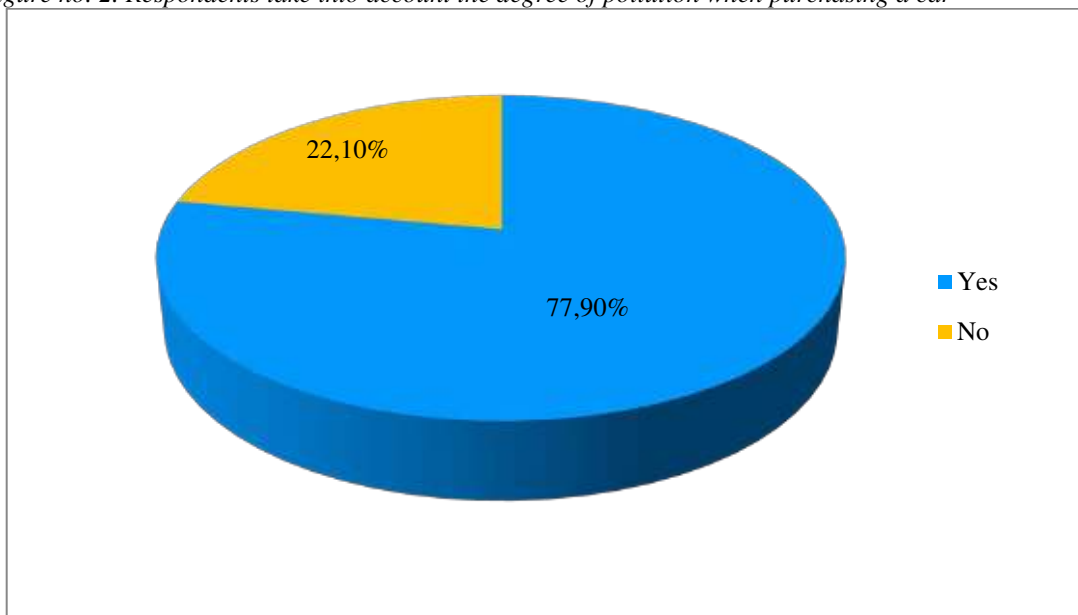
Figure no. 1. Owning a car



Source: Authors' own research

In order to analyze the importance of the degree of pollution of the car from the point of view of the respondents, they were asked if the degree of pollution of the car is a decision factor in its purchase. According to the results, 77.9% of respondents claim that the degree of pollution is a decision factor when buying a car (Figure no. 2).

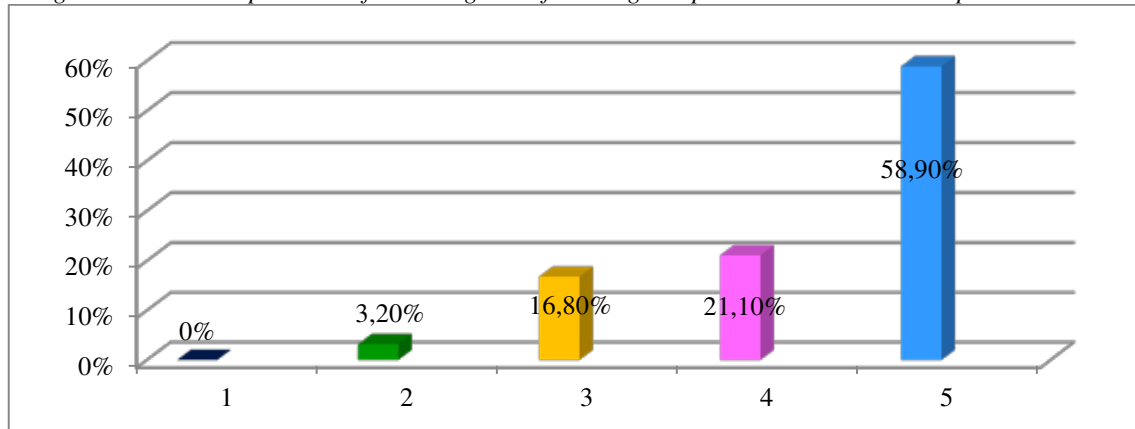
Figure no. 2. Respondents take into account the degree of pollution when purchasing a car



Source: Authors' own research

The following question analyzes the respondents' opinion on the involvement of car companies in environmental protection, which should score on a scale from 1 to 5. Thus, according to Figure no. 3, 58.9% of respondents consider that the involvement of companies is very important (giving score 5).

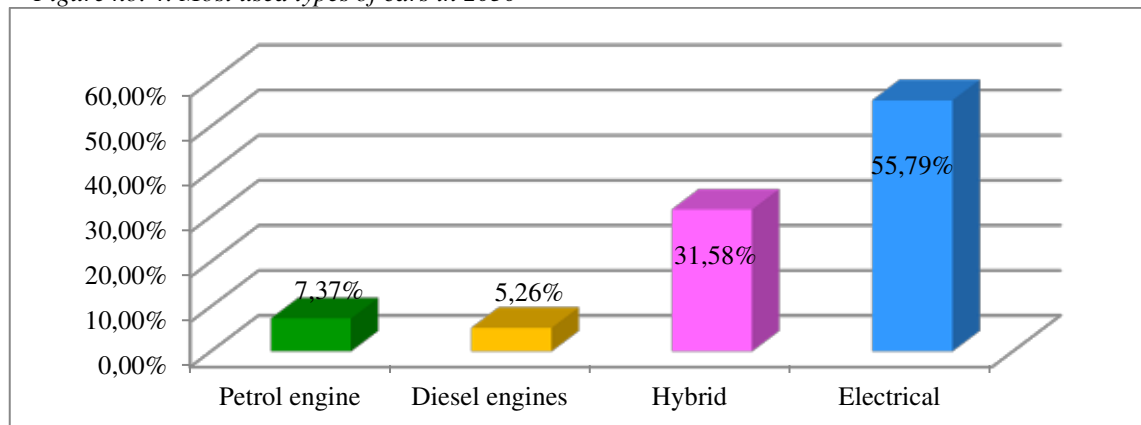
Figure no. 3. The importance of involving manufacturing companies in environmental protection



Source: Authors' own research

According to the results presented in Figure no. 4, most of those surveyed, respectively 55.79% believe that electric cars will be the most used in 2030, and 31.58% believe that hybrid cars will be the most used.

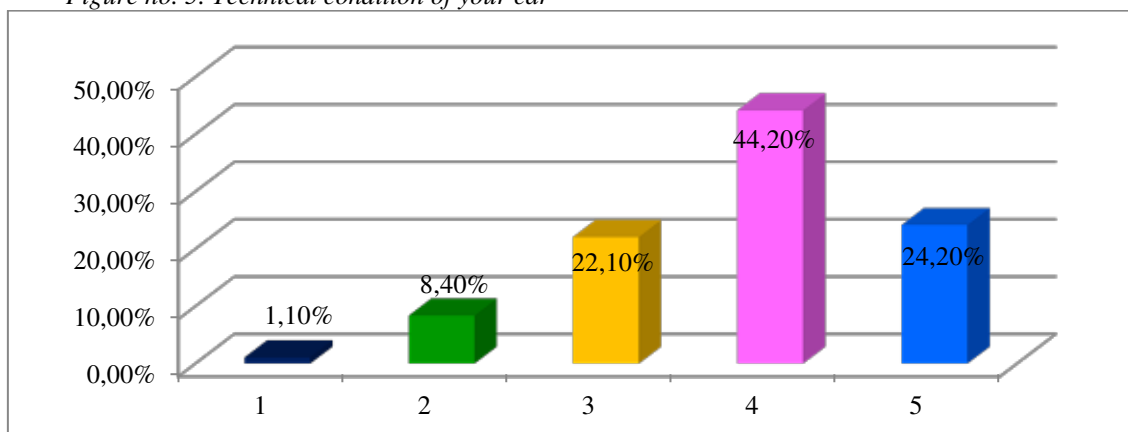
Figure no. 4. Most used types of cars in 2030



Source: Authors' own research

The research aimed to identify respondents' views on the impact of the technical condition of personal cars on the environment. Thus, 44.2% of respondents gave a score of 4, followed by the 24.2% of respondents who gave a score of 5 which shows that subjects consider that the technical condition of the personal car has a low impact on the environment. (Figure no. 5).

Figure no. 5. Technical condition of your car



Source: Authors' own research

7. Conclusions

The automotive industry is strongly influenced by customers and competition, customers being the ones who ensure their survival on the market, and competition is a permanent threat, which must face by implementing an effective strategy. In the competition to attract and retain customers, companies in the automotive industry use quality as a competitive advantage. In the current context, in which society's concern for the environment is constantly growing against the background of climate change, the quality of cars has begun to be more and more often associated with sustainability. Thus, sales of electric cars are constantly increasing, there are more and more customers who want a car that does not pollute. This, together with the laws and measures adopted by states and political organizations to reduce greenhouse gas emissions, have led companies in the automotive industry to rebuild their strategy, making progress in developing a sustainable development strategy by producing electric cars and the creation of automotive component recycling programs.

To stay in the market, car manufacturers need to innovate, not only in the components they use, but also in the field of management, by forming alliances with software and hardware companies, other car manufacturers and suppliers. from other fields.

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