

Review

Sustainability Strategies and Achieving SDGs: A Comparative Analysis of Leading Companies in the Automotive Industry

Edi Lukin, Aleksandra Krajnović  and Jurica Bosna * 

Department of Economics, University of Zadar, Splitska 1, 23 000 Zadar, Croatia; edi.lukin@gmail.com (E.L.); akrajnov@unizd.hr (A.K.)

* Correspondence: jbosna@unizd.hr

Abstract: Sustainability as a growing trend in the 21st century has encompassed almost the entire world economy, including the automotive industry. As a result of this trend, automotive companies are adjusting their strategies and operations to contribute to the achievement of the concept of sustainability at the global level. By turning to sustainability, the automotive industry is experiencing perhaps the biggest transition in its history. This paper therefore deals with the research of sustainable strategies of leading companies in the automotive industry. The paper aims to examine the extent to which the world's leading companies in the automotive industry meet certain SDG UN goals. The method of the qualitative comparative analysis using the desk method alternative provided the information on sustainability strategies and their fulfilment within the top five companies in the automotive industry according to the Interbrand scale from 2021, considering the UN Agenda 2030 sustainability goals. The results of the analysis showed that the observed companies in the automotive sector meet most of the goals of sustainable development of the UN with their sustainability strategies, which indicates that they are successfully adapting their business operations to modern business requirements. This also makes their brands green, hence the application of the principle of sustainability also affects the strength of their brands, adding “extended customer value”. The paper contributes not only to the development of the framework and elaboration of business models of sustainability in the automotive industry, but also to the development of further theoretical and empirical research in this field and the conceptualization of the principles of sustainability in this area.

Keywords: sustainable development strategies; circular economy; sustainable development goals; automotive industry; brand sustainability



Citation: Lukin, E.; Krajnović, A.; Bosna, J. Sustainability Strategies and Achieving SDGs: A Comparative Analysis of Leading Companies in the Automotive Industry. *Sustainability* **2022**, *14*, 4000. <https://doi.org/10.3390/su14074000>

Academic Editors: Ionica Oncioiu and Sorinel Căpușeanu

Received: 26 February 2022

Accepted: 25 March 2022

Published: 28 March 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The concept of sustainable development can be interpreted in different ways, but essentially it is an approach to development that strives to balance different and often competing needs against a rising awareness of environmental, social, and economic limitations. Sustainable development is a development that meets the needs of the present, without compromising the ability of future generations to meet their own needs [1]. At the beginning of the 21st century, few words have gained as much popularity as the word “sustainability”, especially in the social economy, which can be briefly described as: “the ability to sustain a function or process” [2].

“Over 95% of CO₂ emissions into the air come from natural sources, such as organic decomposition or fires or volcanic activity. However, these 95% of emissions are absorbed and balanced naturally through photosynthesis and other forms of decomposition, and the problem remains the 5% that are caused by human activity and for which our environment is not dimensioned. The consequence of “these miserable” 5% is warming, increasing the greenhouse effect and further warming of the Earth’s surface and atmosphere” [3] (p. 12).

The new approach to sustainability in the economy is referred to as circular economy, which is the opposite of the dominant linear economy. Linear economics is based on the principle of production, where natural resources are converted into products by production and consecutively into waste. The circular economy strategies aim to minimize the net impact of production on the environment, by replenishing the acquired resources, thus reducing the amount of waste. The key premise of this approach is that overall systems (strategies) should be optimized, and not individual components [4], which is a key starting point for research in this paper. “Circular economy is emerging as a new sustainability paradigm. Similarly, eco-innovation is being recognized as one of the most important mechanisms that allow the transition from a linear to a circular economy in production processes, as there is a strong relationship between eco-innovation (eco-innovation of products, processes, and management) and circular economy activities. However, the relationship between eco-innovation and circular economy is an issue that has been isolated and little analyzed in the academic literature” [5] (p. 1). “Research stream on Circular Business Models has recently emerged within the management research to address the concept of Circular Economy from a business model perspective. Several studies in this stream have identified and analyzed a set of managerial practices that can be adopted by companies to design Circular Business Models. However, current research still falls short to provide a systematic view of the enablers and barriers for the design of Circular Business Models and the adoption of related managerial practices” [6] (p. 1).

The trend of sustainability also reflected on the automotive industry, which enabled greater human mobility and ability to cover long distances in a relatively short time. Today’s world would be unthinkable without the automotive industry. This very industry is currently experiencing major changes in its business due to the growing focus on environmental protection and sustainable development of the planet Earth. In the automotive industry, new business models are being created that use new and renewable materials and innovative production processes.

“The relationship of the automotive industry with raw material supply is a major challenge and presents obstacles. Automobiles are ones of the most complex products using a large variety of materials. Safety, eco-friendliness and comfort requirements, physical, chemical and economic limitations set the framework in which this industry continuously optimizes the efficient and responsible use of resources. The concept of circular economy covers the issues of waste generation, resource scarcity and economic advantages” [7] (p. 1). “The automotive industry is facing on-going challenges to improve the sustainability of its manufacturing processes and vehicle emissions due to economic, environmental, marketability and policy concerns” [8] (p. 1).

When the conceptual framework for the application of sustainability in the automotive industry is examined, a research gap in this area appears, because there is no solid research agenda on sustainability in the automotive industry. “The review shows that the state-of-the-art literature is far from offering such an agenda” [9] (p. 1). The referring papers are generally limited to provide concepts of sustainability in supply-chain [10–12]. Likewise, research on technological regimes can shed light on the microeconomic dynamics of environmental innovation. The literature on environmental innovations mainly focuses on the role of regulation as a stimulus for technological innovations but not much attention is paid on the innovation process itself and on its features and determinants at the industry and firm levels [13] (p. 568).

In accordance with the above, the authors in this paper use an insufficiently researched, sectoral approach and focus on strategies and performance of sustainability in business. The paper uses a model of analysis of sustainable development strategies of leading companies in the sector in the context of achieving global sustainability goals according to the UN definition. By contributing to the achievement of certain goals of sustainable development of the UN, the achievement of sustainability on the entire planet Earth is promoted, which reflects the social responsibility of modern companies in a globalized society.

This paper analyzes the sustainable business strategies applied by car manufacturers of the top five companies in the automotive industry, based on the analysis of their non-financial sustainability reports from 2020 and other information available on their official websites, or using the desk method respectively. A comparative analysis of the strategies and performance of the sustainability principles of these companies was performed, so that individual activities were classified according to their contribution to each of the seventeen UN Sustainable Development Goals (SDGs) as defined by the 2030 UN Agenda. The aim of the comparative analysis was to examine how many of the UN's sustainable development goals are met by the observed companies, to what extent, and by which performance-business activities. In this way, it was concluded to what extent the five leading automotive industry companies contribute to the concept of sustainability at the global level. In the analysis, these companies were selected based on Interbrand's ranking of the top 100 global brands in 2021, as the five companies with the highest brand value in the automotive industry that year.

The conducted comparative qualitative analysis using multiple case studies yielded interesting results showing to which extent the analyzed car companies: Toyota, Mercedes Benz, BMW, Honda, and Hyundai meet global sustainable development goals, as well as the ways in which they interchange their strategies and performance towards environmentally friendly vehicles, application of new technologies and other activities that support sustainability.

The novelty of this paper and also its scientific contribution consists in fact that the authors have reviewed the fulfilment of the principle of sustainability of the UN 17 SDG Agenda 2030. In this way, the authors advocate that the principle of sustainability and socially responsible business be more and more strongly linked to globally accepted goals and measures of sustainability, which are clearly articulated and strategically set in the Agenda 2030. Namely, the authors believe that one of the main shortcomings in monitoring the fulfilment of sustainability goals in business organizations is their mutual inconsistency. Company management arbitrarily makes decisions on setting and accomplishing sustainable development goals (of course, with the exception of those prescribed by Law), so it often happens that companies 'wander' in their fulfilment; namely, these goals differ between various companies.

2. Theoretical Aspect of Sustainability and Sustainable Development Goals (SDG)

Rarely has a term developed world-class status so quickly or with such profound implications as the term "sustainability". In a relatively short period of time, sustainability has become a metaphor for describing current globalist problems. On the other hand, it is quite a ponderous and general term, present in a wide range of topics and has become extremely popular, especially in relation to economic activities. In the field of ecologically oriented economy, it has significantly revived research and become the starting point for a new approach for research. There is even talk of a paradigm shift, where sustainability is seen as a driver of innovation, and the growing debate on global environmental issues has highlighted and further strengthened this trend.

The notion of sustainability has gained today's popularity through environmental policies, particularly through the work of the United Nations (UN) and its Environmental Conferences [14]. The last UN conference was held in 2015, and it adopted a document entitled 'Transforming our world: the 2030 Agenda for Sustainable Development', or shortly, the UN Agenda 2030, which defined and adopted the UN program for sustainable development by 2030. The main backbone of the UN Sustainable Development Program is constituted by 17 major Sustainable Development Goals, known as SDGs, which seek to address today's global problems in the economic, social, environmental, and political security areas as shown in Table 1 [15].

Table 1. Sustainable Development Goals.

Goal 1. End poverty in all its forms everywhere
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5. Achieve gender equality and empower all women and girls
Goal 6. Ensure availability and sustainable management of water and sanitation for all
Goal 7. Ensure access to affordable, reliable, sustainable, and modern energy for all
Goal 8. Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation
Goal 10. Reduce inequality within and among countries
Goal 11. Make cities and human settlements inclusive, safe, resilient, and sustainable
Goal 12. Ensure sustainable consumption and production patterns
Goal 13. Take urgent action to combat climate change and its impacts *
Goal 14. Conserve and sustainably use the oceans, seas, and marine resources for sustainable development
Goal 15. Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels
Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

* Acknowledging that the United Nations Framework Convention on Climate Change is the primary international, intergovernmental forum for negotiating the global response to climate change.

It should also be emphasized that the concept of sustainability and the contiguous concept of sustainable development intertwine three different disciplines, i.e., dimensions, specifically: economics, sociology, and ecology. The economy views sustainability as a limiting factor in achieving economic goals such as a focus on profitability, growth, and efficiency. Sociology views sustainability in terms of achieving the goals of equitable resource allocation and poverty reduction, while ecology is focused on achieving sustainability through natural resource management. Since the goals and requirements of these disciplines are different, sustainability and sustainable growth can only be achieved if their close cooperation is achieved in which the diversity of each discipline is appreciated [16].

As organizations' sustainability strategies mature, they begin to change the business model describing the organization's work fundamental logic. The business model helps define competitive strategy, affects the product design, and thus environmental and social impacts in the value chain on the value the product brings, including environmental or social value, and how the company perceives some of these values. At its core, the business model will present value proposals, value creation, and a value perception aspect [4].

One of the most important reasons why companies choose to implement sustainable strategies is because the demand in almost every industry for environmentally friendly products is increasing. The reason for this increase in demand is, among other things, that consumers want to feel better about everything they buy [17]. Brand managers face a major challenge in brand management because they need to ensure a sustainable and eco-minded image, which is quite difficult in industries that do not have such a good reputation for their environmental efforts [18].

Sustainable business strategies are based on evaluating the needs of all key stakeholders of a particular company, where the company is oriented towards achieving sustainable goals, namely the principles of sustainable development and environmental protection. By implementing sustainable strategies, the company undertakes to make plans and decisions in its business that will contribute to the well-being of society and the environment as a whole, respectively, not only economic but also social and environmental effects of the company are considered [12].

The Croatian Business Council for Sustainable Development in cooperation with the WBCSD (World Business Council for Sustainable Development) has issued recommendations to managers to help implement the circular economy in business in the form of five business models and three advanced technologies. Business models are:

- circular procurement,
- resource recovery,
- product life expansion,
- sharing platform,
- product as a service.

Three advanced technologies that facilitate the application of the circular economy are:

- digital technologies,
- physical technologies,
- biological technologies.

Sustainability also has a significant effect on brand value. Consumers are more likely to choose brands that protect the environment and contribute to social responsibility [19]. Companies started to implement sustainable reporting because they started to be aware of its importance for customers [20]. The implementation of sustainability strategies affects customer satisfaction and company profitability. In this way, they achieve their long-term goals, while promoting sustainability and increasing the value of their brand [21].

3. State and Trends in the Automotive Industry

At the beginning of the 21st century, the automotive industry certainly looked like a mature industry with a very stable structure and quite predictable, in the theories and economic practices present at the time whereby evolutionary innovation, consolidation, large corporations, etc. were key arguments. For over a decade now, the industry has been experiencing significant turbulence due primarily to changes in markets, regulatory requirements, and technologies." [22] (p. 605).

Globalization is significantly affecting the automotive industry since it is becoming more and more extensive, evolving at different stages of car production. The legal regulations at the national and global level related to energy consumption, greenhouse gas emissions, and safety are placing increasing demands on car manufacturers. These demands are driven by a complex socio-political agenda that combines a growing desire for less oil dependence with growing concerns about climate change, air pollution, and other negative externalities of the automotive industry such as congestion in big cities. Technological advances in the field of electronics, communications and Internet technologies are constantly being introduced in the creation of new vehicles. A whole range of evolutionary and radical technological advances is on the horizon about various forms of drive for car engines, from fully electric vehicles through hydrogen fuel cells to biofuels [22].

Four key trends in the automotive industry that have remained stable since 2017 and have established themselves as key trends are: battery-powered cars, connectivity and digitization, hydrogen fuel cell cars, and hybrid vehicles. What also characterizes the automotive industry is the growth of market share in emerging markets, understanding the mobility ecosystem, mobility as a service, autonomous and self-driving vehicles, Big Data concept, platform strategies and module standardization, reducing internal combustion engines, and streamlining or digitalization of the production respectively [23].

The car of the future will be an electrically powered, autonomous, shared, connected, and annually updated vehicle. Electricity used to charge vehicles should come from renewable sources to ensure neutral mobility in terms of carbon dioxide emissions. The rapid progress that has been made in areas such as artificial intelligence, machine learning, and deep neural networks allows the development of autonomous vehicles, which was previously unthinkable. To extend the life cycle of each car model, which typically lasts five to eight years, car updates will be carried out annually to incorporate the latest innovations from car manufacturers in the field of hardware and software. That way, users will have

a more advanced vehicle without having to buy a new generation of a particular type of car [24].

New entrants from the high-tech and similar industrial sectors are likely to become important players in the automotive industry. Current trends such as efficient, environmentally friendly, smart, and connected vehicles affecting the automotive industry will also have a major impact on the skills of the workforce employed in the industry at all levels. The way training is conducted in the industry will change and older functions and activities will disappear. New competencies and capabilities will need to be developed to follow evolutionary trends to ensure the technological survival of automotive market players [25].

The automotive industry is a complex system of connections, direct and indirect products, and interactions for the purpose of creating economic value. As this industry has a significant impact on the environment, the economy, and people, it also plays a significant role in sustainable development. Regulatory agencies evaluate car and parts companies to ensure that these companies meet environmental standards and reduce the environmental impact of production processes and products themselves. This pressure has led to the adoption of innovative business strategies and cutting-edge information and communication technologies to achieve environmental and economic goals. Implementing sustainable development helps companies reduce their impact on the environment, economy, and society [26].

Implementing the Sustainable Development Goals (SDGs) and increasing environmental problems is causing changes in consumer and stakeholder behavior. Stakeholders are trying to invest in green companies and projects, consumers prefer to buy organic products instead of traditional ones, and consumers and investors refuse to deal with environmentally unfair companies. In this case, companies need to quickly adjust their strategy to suit the new trend of transformation from over-consumption to green consumption [27].

The car as a product is specific because it is not just about emissions from the exhaust pipes of the car while driving, but the process of pollution is much broader and more comprehensive. A car uses energy and generates emissions even before it becomes a vehicle. Therefore, in order to determine the total harmful impact of a car on the environment, it is necessary to look at its entire life cycle. This is called a Life Cycle Assessment (LCA). It all starts with creating the materials that make up a car. Raw ore is taken from the earth and used to make materials that require energy and generate emissions. Then the vehicle is produced, which leads to even more emissions. Only after an individual buys a vehicle and starts driving it the emissions from the exhaust pipe occur, which is also called the phase of use in its life cycle. Eventually, it takes energy to move the car to waste and recycle it back into materials to make new cars and then the life cycle starts all over again.

One of the measures that shows how much a given product has emitted greenhouse gases is carbon footprint, which measures the amount of CO₂ emissions caused by a certain product [28] (p. 16). It is interesting to note that environmental indicators are increasingly turning to customers, to actively involve them in the application of the concept of sustainability. For example, WorldAutoSteel has developed a system of indicators to monitor the emissions of certain car models, called the Vehicle Emissions Impact Indicator. It is an interactive tool that helps consumers to make decisions about buying a car, with the information on the engine the car will be powered with and the material a car will be made from and see how that will affect its overall environmental performance in terms of its total life cycle emissions and fuel consumption [29].

4. Materials and Methods

The car manufacturers taken into consideration are the five most valuable world brands in the automotive industry according to the Interbrand ranking of the top 100 world brands in 2021. These are the following brands, with their ranking on the Interbrand list in parentheses: Toyota (7th place), Mercedes-Benz (8th place), BMW (11th place), Honda (20th place), and Hyundai (36th place).

To be included in Best Global Brands, a brand must be truly global, having successfully transcended geographic and cultural boundaries. The requirements that brands must meet are their global presence, profitability, visibility, and relative transparency of financial results. The three basic components that go into calculating brand value are the analysis of the financial success of the brand, the role of the brand which plays in purchasing decisions, and the brand's competitive strength. In financial analysis, the overall financial return to organization's investors or its economic profit is measured. Role of brand measures the portion of the purchase decision attributable to the brand as opposed to other factors like purchase drivers such as price, convenience, or product features. Brand strength measures the ability of the brand to create loyalty and, therefore, sustainable demand and profit into the future. The calculation of the strength of a brand includes all its current activities that contribute to its future value. This emphasizes the need to adapt to modern trends in the environment that require, among other things, the application of sustainability strategies in business [30].

The case analysis of each individual company used their latest available non-financial sustainability reports for 2020 [31–35] as well as other data collected from their websites [36–40] to assess their contribution to achieving the UN Sustainable Development Goals. The comparative analysis of sustainable strategies of the observed top five brands of car manufacturers consists of their connection with the goals of sustainable development of the UN.

5. Results

Table 2 shows which goals of each company the top 5 brands meet, while Table A1 (in Appendix A) shows the activities through which the observed companies contribute to a particular goal of sustainable development of the UN, which was achieved by desk method-analysis of their non-financial reports and information from official websites.

Table 2. Coverage of the UN Sustainable Development Goals into sustainable automotive strategies.

Brand	Toyota	Mercedes Benz	BMW	Honda	Hyundai
1. End poverty in all its forms everywhere				✓	✓
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture				✓	
3. Ensure healthy lives and promote well-being for all at all ages	✓		✓	✓	✓
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	✓	✓	✓	✓	✓
5. Achieve gender equality and empower all women and girls		✓	✓	✓	✓
6. Ensure availability and sustainable management of water and sanitation for all	✓	✓	✓	✓	
7. Ensure access to affordable, reliable, sustainable, and modern energy for all	✓	✓	✓	✓	✓
8. Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all	✓	✓	✓	✓	✓
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	✓	✓	✓	✓	✓
10. Reduce inequality within and among countries	✓	✓	✓	✓	✓
11. Make cities and human settlements inclusive, safe, resilient, and sustainable	✓	✓	✓	✓	✓
12. Ensure sustainable consumption and production patterns	✓	✓	✓	✓	✓
13. Take urgent action to combat climate change and its impacts	✓	✓	✓	✓	✓
14. Conserve and sustainably use the oceans, seas, and marine resources for sustainable development				✓	✓
15. Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	✓	✓		✓	✓
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels		✓		✓	
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development	✓	✓	✓	✓	✓

The results of the comparative analysis show that Honda is the only company among the top five brands according to Interbrand that implements sustainable strategies that include all sustainable UN goals. Furthermore, Table 2 shows that objectives 4, 7, 8, 9, 10, 11, 12, 13, and 17 are also objectives to which all companies contribute their strategies. Table A1 shows that car companies have different approaches to most of their goals-activities to achieve the same, but similarities are also recognized. For example, contribution to goal 10 shows that companies have a similar strategy aimed at creating a corporate culture that respects differences and eliminates inequalities, while goal 15 of the sustainable development has quite different approaches to companies. Table A1 further shows how the 8th, 9th, 11th, 12th, and 13th goals stand out from the goals to which all companies contribute; namely, it can be said that in these areas companies mostly develop their sustainable strategies. The reason for this may lie in the fact that these goals relate to decent work and economic growth, innovation, achieving sustainable cities and communities, responsible consumption, and climate protection, and those areas that are most associated with the automotive industry. In other words, companies are more likely to develop sustainable strategies in those areas that directly affect them and for which they are often called out in public.

6. Discussion

Problems of environmental pollution have forced car manufacturers to turn to socially responsible business to meet the criteria for achieving the concept of sustainability at the global level. To find out to what extent the top five brands of the automotive industry contribute to the concept of sustainability, non-financial reports on sustainable development and other information available on the official websites of the considered companies were analyzed in this paper. As a criterion for contributing to the realization of the concept of sustainability, the goals of sustainable development defined by the UN were chosen, as they cover all key areas aimed at achieving a globally sustainable society. By linking sustainability strategies with the fulfilment of individual UN sustainable development goals, the paper acquired results to which extent the top five automotive industry brands contribute to global sustainability.

An analysis of the sustainable strategies of the top five automotive brands, which include Toyota, Mercedes-Benz, BMW, Honda, and Hyundai, found that these companies are truly moving towards sustainable business through their production and product performance, making them more green brands. The following was especially noticed from the conducted research:

- Leading automotive companies are constantly increasing their range of more environmentally friendly vehicles, including electric and hybrid vehicles and fuel cell vehicles.
- In their supply chains, companies raise the level of responsibility by setting requirements for their business partners in the form of reducing the harmful impact on the environment, but also greater protection of labor rights.
- Special attention is paid to educating employees to adapt to new business challenges such as digitalization. Furthermore, they are provided with increasingly favorable working conditions, and companies are developing a corporate culture that respects diversity.
- Volunteer activities are encouraged, and charitable organizations are supported.
- The use of renewable energy sources is encouraged, the consumption of resources in production is reduced, new business models for providing mobility services are introduced, and similar activities are introduced within the production process related to product performance, sustainability in the value-chain system and the like.

Comparative analysis showed that the observed automotive companies with their sustainability strategies meet most of the defined 17 UN Sustainable Development Goals, at least 12 per company, which indicates that they are aware of the role and importance of sustainable development in the modern economy. Of all the observed companies, only Honda, which according to the Interbrand scale is on the 20th place in the top 100 global brands, meets all the goals of sustainable development, and among the analyzed compa-

nies, according to the brand value criterion, it is only on the fourth place. Based on this comparison, it could be concluded that the financial value of the brand is not affected by sustainable strategies, it should be borne in mind that all companies considered meet most SDGs, and that the difference between them is relatively small. Furthermore, the effects of the observed sustainability innovations on brand value will only be achieved over time, as this is a long-term, strategic aspect of the business.

7. Conclusions

This paper contributes to the theory of sustainability and sustainable strategies in industry, applying a sectoral approach, on the example of automotive industry. Furthermore, this paper aims to stimulate further scientific, socio-political, and economic debate on the need to align strategic goals of economic organizations with SDGs defined by the UN, in order to achieve strategic consistency and coherence of all stakeholders in achieving sustainability, in line with goal 17—Strengthen the means of implementation and revitalize the global partnership for sustainable development. The authors emphasize the fact that the strategy and monitoring of sustainability are particularly important in the automotive industry, given the specifics of production in that industry and the long and specific life of cars, but also given the widespread use of cars that leads to significant pollution in cities and thus significantly contributes to the pollution of the planet Earth. Thus, we are talking about production and products that are very relevant when it comes to the discourse on the realization of SDG. The model adopted by the authors of this paper, in the alignment of the company's strategic goals with 17 UN SDG goals, could be incorporated into regular non-financial reports of companies and other organizations, which will be publicly available to all. As practical implications of the work, Table 2 shows the good practices of the world's leading companies in the sector that can serve as a guide and guidance for other companies that have opted for sustainability.

As a limitation of the research, it should be noted that this comparative analysis is limited to five leading world companies in the automotive industry. For the purposes of this paper, the authors considered that the five analyzed leaders in the automotive industry make a sufficient grouping of brands from the automotive industry that can serve as representatives in the context of research conducted in this paper. However, for future further research, it is certainly recommended to encompass a larger number of companies from this industry, so that the researched issues can be considered more broadly. Furthermore, the paper analyzes the application of the principle of sustainability from the point of view of economists, so for further consideration it is recommended to include interdisciplinary teams from several different fields (technical sciences, technology, ecology, etc.).

In this sense, this paper encourages consideration of a broader understanding of sustainability in industry, and not too often considered, only environmental impact and promoting sustainability in the narrow sense—in the production process and supply chain. In general, it can be concluded that a solid conceptual framework for optimizing sustainability in the automotive industry has not yet been developed, namely there is a significant research gap in this area when it comes to the sectoral approach in general. Additionally, a standard system of sustainability indicators in the automotive industry has not yet been built in line with the broader understanding of the concept of sustainability. In this sense, the contribution of this research and the comparative analysis presented by the authors is evident.

The paper also provides a practical (professional) contribution, by serving as a guide and report tool for the adoption of sustainability strategies and the introduction of innovative eco-business models at the level of individual automotive companies and related (complementary) sectors. At the same time, the paper is contributing to the awareness of decision makers in companies about sustainable global goals and their fulfilment. The paper can also serve as a groundwork for considering the issue of sustainability of technology

to lawmakers in the public sector, but also as a guideline and platform for monitoring the fulfilment of SDG by practitioners and analysts from various fields of science and practice.

As guidelines for further research and expert analysis in the field of sustainable strategies, the authors recommend research on the extent to which the area of meeting certain UN SDG goals is included in non-financial reports of companies and other economic organizations. It is also recommended to investigate in which sectors the organizations have defined sustainability strategies, whether they monitor them, and whether they have developed a system of sustainability indicators, according to each SDG. Through individual sectoral analyses, the environmental, social, and economic impacts and costs of each relevant sustainability activity can be further explored and confronted in order to understand the extent to which a balance has been struck between these three aspects of sustainability.

Author Contributions: Conceptualization, E.L. and A.K.; methodology, E.L., A.K.; formal analysis E.L. and J.B.; investigation, E.L., A.K., J.B.; writing—original draft preparation, E.L., A.K., J.B. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Data available in a publicly accessible repository that does not issue DOIs. Publicly available datasets were analyzed in this study. This data can be found here: BMW Group. Sustainable Value Report 2020. Available online: <https://www.press.bmwgroup.com/global/article/attachment/T0327938EN/474234> (accessed on 18 December 2021). Daimler, A.G. Sustainability Report 2020. Available online: <https://sustainabilityreport.daimler.com/2020/servicepages/downloads/files/daimler-sr-2020.pdf> (accessed on 18 December 2021). Honda. Honda Sustainability Report 2020. Available online: <https://global.honda/about/sustainability/report/pdf-download.html> (accessed on 15 December 2021). Hyundai. Sustainability Report 2020. Available online: <https://www.hyundai.com/worldwide/en/company/sustainability/sustainability-report/T1/textgreater{}> (accessed on 15 December 2021). Toyota Motor Corporation. Sustainability Data Report 2020. Available online: https://global.toyota/pages/global_toyota/sustainability/report/sdb/sdb2008_en.pdf (accessed on 13 December 2021). Honda Official Web Site. Available online: <https://www.honda.com/> (accessed on 15 December 2021). Hyundai Official Web Site. Available online: <https://www.hyundai.com/worldwide/en/> (accessed on 18 December 2021). Mercedes Benz Official Web Site. Available online: <https://www.mercedes-benz.com/en/> (accessed on 18 December 2021). Toyota Official Web Site. Available online: <https://www.toyota.com/> (accessed on 18 December 2021). BMW Official Web Site. Available online: <https://www.bmw.com/en/index.html> (accessed on 18 December 2021).

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Analysis of automotive sustainable development strategies in 2020 with regard to the UN Sustainable Growth Goals.

Brand	Toyota	Mercedes	BMW	Honda	Hyundai
1. World without poverty				Improving the living conditions of the people of developing countries by offering them adapted mobility products and services.	Providing support and involvement in collaborative activities based on the needs of local communities.
2. World without hunger				Implementing the eMaaS project.	
3. Health and well-being	Reduction of harmful chemicals in automotive parts and reduction of air pollution. Application of safety systems in driving. Support for non-profit and non-governmental organizations.		Reduction of air pollution by hybrid and electric vehicles. Establishment of the Health Initiative dealing with the areas of health management, occupational safety, and ergonomics.	Reduction of air pollution in the phase of use and production of vehicles. Reducing traffic accidents with the help of assistance systems, accident prevention, and increasing the strength of the car. Reduction of chemicals in the materials of car components that adversely affect the environment.	Development of new safety technologies and activities to prevent accidents.
4. Quality education	Implementation of social contribution programs, education of people on sustainability.	Enabling employees to acquire knowledge and skills for the needs of the digital age throughout their working lives.	Offering a wide range of training and education so that workers can acquire the necessary skills to work. Conducting education for young people who have just entered the labor market and thus provide new opportunities for their own development.	Educating staff on and off the job to acquire specialized skills and professional abilities.	Support to victims of traffic accidents through education. Providing opportunities for the growth of future generations, children, teenagers and young people through education, training, and event organization.
5. Gender equality		Increasing the share of women in leading management positions.	Development of business culture of gender diversity. Rewarding projects that solve the problem of diversity in society.	Implementation of initiatives aimed at increasing the share of employed women, especially in managerial positions. Supporting LGBT communities.	Building a corporate culture that respects diversity.
6. Clean water and sanitation	Reduce water use in production by 3% per vehicle. Water recycling and rainwater use in production.	Reduction of water consumption in production by 33% for passenger cars and 28% for commercial vehicles by 2030.	Implementation of a volunteer project that provides drinking water in the homes of residents of Mexico, India, and Thailand.	Reducing water use in car production, reusing used water and purifying water before releasing it into the environment. Management of the North American Water Conservation Fund under the Honda Marine Science Foundation. Establishment of a Chemical Management System, and reduction of four types of heavy metals (lead, mercury, hexavalent chromium, and cadmium) in vehicle production.	
7. Affordable energy from clean sources	Electrification of cars on offer. Use of renewable energy sources in production.	Investments in the development of technologies for the creation of environmentally friendly vehicles (electric, hybrid, fuel cells). By 2030, reduce energy consumption by 43% in the production of passenger cars and 25% for commercial vehicles through “Environmental Design”.	Investing in sustainability throughout the life cycle of vehicles (encouraging electricity from renewable sources and recycling) and expanding the network of electric charging stations.	Implementation of the eMaaS project. Increasing electric and hybrid vehicles, and fuel cell propulsion on offer.	Reducing fuel consumption by applying new engine technologies, reducing car weight by using light vehicle components, using renewable energy sources in cars.

Table A1. Cont.

Brand	Toyota	Mercedes	BMW	Honda	Hyundai
8. Decent work and economic growth	Respect for the human rights of all employees. Employment of migrants and strong condemnation of the use of children as labor.	Through digitalization, it is possible to create mobile jobs with flexible working hours. Investing funds to reduce human rights violations in the supply chain. Ensuring humane working conditions in our own units.	Ensuring that employees remain healthy and able to work as they age. Ergonomically adjusted workplaces with a high level of safety. Wages of workers above market average. Helping workers to balance private and business life.	Establishment of a Code of Conduct. Monthly workforce management status checks of all local branches. Development of a “Roadmap for Sustainable Growth” in which the identification of priority management issues is key. Establish a basic health and safety policy.	Evaluation and monitoring of suppliers with regard to safety management. Compliance with labor protection laws and communication with trade unions. Developed tools to prevent worker injuries. Providing support to children, teenagers, and young people for development.
9. Industry, innovation, and infrastructure	Promoting technological development for the use of hydrogen. Developing technology for the use of recycled materials. Increasing transport safety.	Development of sustainable technologies for the production of environmentally friendly vehicles. Participation in initiatives for the development of sustainable technologies. Construction of factories with a high level of networking. Development of sustainable mobility of the future.	Invest in technology that enables reduced fuel consumption. Investing in the development of products with the lowest possible CO ² 2 emissions throughout the life cycle of the vehicle. Providing mobility services. Application of technologies in production that enable lower consumption of resources.	Implementation of the eMaaS project that combines mobility services and energy services. All cars are equipped with low-emission engines that meet the strictest emissions regulations in the world. Reducing the burden on the environment by taking measures in logistics. In the car production phase, pollution during car painting is reduced.	Investing in smart mobile services. Investing in the development of technology, especially in the development of the car operating system. Establishment of five innovation bases around the world. Mobile innovation aims to provide solutions for individuals and sectors that do not have access to mobility
10. Reducing inequalities	Promoting the inclusion and freedom of workers by providing them with secure jobs.	Developing a corporate culture where all employees respect each other regardless of diversity.	Participation in initiatives that promote equality of workers. Promoting gender balance, different cultures and the age of workers.	Implementing initiatives for all collaborators around the world aimed at facilitating the understanding of the importance of diversity.	Building a healthy corporate culture that respects inequalities. Provide equal access to transport for all mobile innovations. Involvement of young generations in the development of the company.
11. Sustainable cities and communities	Improving air quality for low CO ² vehicles. Environmental risk management by undertaking preventive activities. Implementation of community development programs.	Reduction of pollution of urban areas with nitrogen dioxide. Promoting sustainable mobility in urban areas through its offerings of electrified city buses and trucks, car sharing and multimodal connectivity of mobility services.	Solving air pollution problems and reducing vehicle noise with electric mobility. Solving urban problems with automated and digitally networked vehicles.	Implementing the eMaaS project. Electrification of vehicle supply. Supply of vehicles from various renewable sources. Reduce traffic accidents by establishing its own collision testing facility from all directions.	Increasing vehicle safety and quality by monitoring the quality of parts, automated inspection, and repair of the electronic driver assistance system. Developing car construction that is more resistant to collisions and better protects passengers. Development of safety technologies and for the prevention of traffic accidents.
12. Responsible consumption and production	Reduction of CO ² emissions from the entire life cycle of the car. Establishment of 15 recycling plants. Implementing projects that promote harmony with nature and educating people about ecology. Management of chemicals used in business. Implementation of social contribution programs.	Request from suppliers to sign an Ambitious Letter committing to deliver CO ² neutral products in the future. Increasing vehicle efficiency and significantly reducing the use of raw materials. Reduction of energy and waste in production and use of secondary raw materials.	Establish cyclical material circulation processes to increase vehicle recycling and reduce solid waste generation. Design vehicle components in a way that they can be easily recycled. Encouraging the use of electricity from renewable sources at the level of the entire supply chain. Establishing sustainability in the supply network by setting sustainability criteria for its suppliers. Construction of own solar panels at production plants and use of electricity from renewable sources.	Increasing the share of electric and hybrid vehicles, and fuel cell vehicles in its own offer. Encouraging the reduction, reuse and recycling of resources while reducing production waste.	Establishment of a “Code of Supply Conduct”. Providing support to local community sustainability activities through volunteering, and by supporting projects of NGOs and suppliers.

Table A1. Cont.

Brand	Toyota	Mercedes	BMW	Honda	Hyundai
13. Preservation of climate	Reduction of CO ² emissions during use and production, namely the entire vehicle cycle.	Reduction of harmful gas emissions in the use and production phase and in the entire supply chain.	Development of vehicles with the lowest possible CO ² emissions throughout the life cycle of the vehicle. Supporting the development of harmonized regulations to combat climate change. Application of new technologies that enable reduced environmental pollution (CO ² , wastewater, solid waste). Encouraging its suppliers to participate in a project that monitors their CO ² emissions through annual suppliers' reports.	Improving transport efficiency and reducing the environmental burden. Establishment of a system for monitoring CO ² emissions of own suppliers and continuous implementation of initiatives with suppliers to reduce environmental impact. Increasing the share of electric vehicles in our own offer.	Reducing vehicle fuel consumption. Use of renewable energy sources in cars. Recycling of waste in production, reduction of air pollution, water minimization of waste material and management of hazardous chemical materials.
14. Preservation of the aquatic world				Recycling of water in its plants.	Water reuse in production.
15. Preservation of life on earth	Implementation of a project to strengthen the conservation of globally endangered species. Support for non-profit and non-governmental organizations.	Reduction of water use and waste in production and replacement of raw materials with recycled materials.		Establish guidelines for biodiversity.	Implementation of activities to reduce environmental pollution.
16. Peace, justice and strong institutions.		Protection of personal data of users. Establishment of the Personal Data Management Committee and the Data and Analytics Committee.		Joining the CDP supply chain program. Establishment of a "Code of Conduct". Encouraging timely, decisive, and risky decision-making.	
17. Partnership to goals	Sharing common principles and cooperation with business partners. Involvement in sustainability initiatives by working closely with business partners to raise quality in terms of safety and customer satisfaction.	Establishment of blockchain technologies. Collaboration with associations, organizations and other companies in various projects and initiatives to improve human rights.	Establishment of the Herbert Quandt Foundation, which encourages responsible leadership.	Construction of its own collision testing facility from all directions, which is also leased to other companies and research institutions.	Involvement in collaborative activities based on the needs of local communities, including NGOs and suppliers.

References

1. Sustainable Development Commission. Sustainable Development. Available online: <http://www.sd-commission.org.uk/pages/what-is-sustainable-development.html> (accessed on 5 December 2021).
2. Bačun, D.; Matešić, M.; Omazić, M.A. *Lexicon of Sustainable Development*; Croatian Business Council for Sustainable Development: Zagreb, Croatia, 2012; pp. 198–321.
3. Čorluka, Ž. Impact of Product Life on the Environment. Bachelor's Thesis, University of Zagreb, Zagreb, Croatia, 2010.
4. Long, T.B. *Sustainable Business Strategy, Encyclopedia of the UN Sustainable Development Goals: Decent Work and Economic Growth*; Springer: London, UK, 2019; pp. 1–11.
5. Maldonado-Guzmán, G.; Garza-Reyes, J.A.; Pinzón-Castro, Y. Eco-innovation and the circular economy in the automotive industry. *Benchmark. Int. J.* **2020**, *28*, 621–635. [\[CrossRef\]](#)
6. Urbinati, A.; Franzò, S.; Chiaroni, D. Enablers and Barriers for Circular Business Models: An empirical analysis in the Italian automotive industry. *Sustain. Prod. Consump.* **2021**, *27*, 551–566. [\[CrossRef\]](#)
7. Buruzs, A.; Torma, A. A Review on the Outlook of the Circular Economy in the Automotive Industry. *Int. J. Environ. Ecol. Eng.* **2018**, *11*, 576–580.
8. Giampieri, A.; Ling-Chin, J.; Ma, Z.; Smallbone, A.; Roskilly, A.P. A review of the current automotive manufacturing practice from an energy perspective. *Appl. Energy* **2020**, *261*, 114074. [\[CrossRef\]](#)
9. Hadiguna, R.A.; Jaafar, H.S.; Mohamad, S. Performance measurement for sustainable supply chain in automotive industry: A conceptual framework. *Int. J. Value Chain Manag.* **2011**, *5*, 232–250. [\[CrossRef\]](#)
10. Lüdeke-Freund, F. Towards a conceptual framework of 'business models for sustainability'. In Proceedings of the Knowledge Collaboration & Learning for Sustainable Innovation, ERSCP-EMSU Conference 2010, Delft, The Netherlands, 25–29 October 2010.
11. So, S.; Parker, D.; Xu, H. A conceptual framework for adopting sustainability in the supply chain. In *ANZAM Operations, Supply Chain and Services Management Symposium*; ANZAM: Melbourne, Australia, 2012; pp. 397–413.
12. Phuah, J.S.Y.; Fernando, Y. Green supply chain integration in automotive industry. In *Encyclopedia of Information Science and Technology*, 3rd ed.; Derry Township, USA; IGI Global: Hershey, PA, USA, 2012; pp. 5056–5064.
13. Oltra, V.; Saint Jean, M. Sectoral systems of environmental innovation: An application to the French automotive industry. *Technol. Forecast. Soc. Chang.* **2009**, *76*, 567–583. [\[CrossRef\]](#)
14. Jenkins, I.; Schröder, R. *Sustainability in Tourism: A Multidisciplinary Approach*, 2nd ed.; Springer: Iserlohn, Germany, 2012; pp. 10–30.
15. Transforming Our World: The 2030 Agenda for Sustainable Development. Available online: <https://sdgs.un.org/2030agenda> (accessed on 8 February 2022).
16. Biuk, M. The Importance of Sustainable Marketing with Regard to Changes in the Environment. Bachelor's Thesis, Juraj Dobrila University of Pula, Pula, Croatia, 2012.
17. Iberg, A.E. Creating Competitive Advantage in the Premium Market Segment through a Sustainability Strategy. Chancellor's Honors Program Projects. 2015. Available online: https://trace.tennessee.edu/utk_chanhonoproj/1898 (accessed on 18 December 2021).
18. Harker, L. 10 Global Companies and Their Brand Sustainability. 2022. Available online: <https://latana.com/post/top-global-brands-environment/> (accessed on 8 February 2022).
19. Sing, K. Sustainability: Profitable tool of branding. *Int. J. Res. Manag. Soc. Sci.* **2017**, *5*, 67–73.
20. Osmanagić-Bedenik, N. Business between Profitability and Sustainability. In Proceedings of the 25th IBIMA Conference, Innovation Vision 2020: From Regional Development Sustainability to Global Economic Growth, Amsterdam, The Netherlands, 7–8 May 2015; ISBN 978-0-9860419.
21. De Mendoca, T.R.; Zhou, Y. Environmental Performance, Customer Satisfaction, and Profitability: A Study among Large U.S. Companies. *Sustainability* **2019**, *11*, 5418. [\[CrossRef\]](#)
22. Schulze, A.; MacDuffie, J.P.; Täube, F.A. Introduction: Knowledge generation and innovation diffusion in the global automotive industry-change and stability during turbulent times. *Ind. Corp. Chang.* **2015**, *24*, 603–611. [\[CrossRef\]](#)
23. KPMG Automotive Institute. KPMG's Global Automotive Executive Survey 2020. Available online: https://automotive-institute.kpmg.de/GAES2020/downloads/global_automotive_executive_survey_2020.pdf (accessed on 18 December 2021).
24. Koster, A.; Kuhnert, F.; Stürmer, C. Five trends transforming the Automotive Industry, PwC 2018, 1. Available online: https://www.pwc.at/de/publikationen/branchen-und-wirtschaftsstudien/eascy-five-trends-transforming-the-automotive-industry_2018.pdf (accessed on 14 December 2021).
25. Albulescu, S.; Dascalu, O.; Niculescu, A. Trends in the Automotive Industry. *Faima Bus. Manag. J.* **2015**, *3*, 30–50.
26. Cioca, L.I.; Ivascu, L.; Turi, A.; Artene, A.; Gaman, G.A. Sustainable development model for the automotive industry. *Sustainability* **2019**, *11*, 6447. [\[CrossRef\]](#)
27. Pimonenko, T.; Bilan, Y.; Horák, J.; Starchenko, L.; Gajda, W. Green brand of companies and greenwashing under sustainable development goals. *Sustainability* **2020**, *12*, 1679. [\[CrossRef\]](#)
28. Lukin, E. Sustainable Strategies in Leading Automotive Companies. Master's Thesis, Department of Economics, University of Zadar, Zadar, Croatia, 2021.
29. Vehicle Emissions Impact Indicator, WorldAutoSteel Official Web Site. Available online: <https://www.worldautosteel.org/life-cycle-thinking/vehicle-emissions-impact-indicator/> (accessed on 8 February 2022).

30. Interbrand. Best Global Brands for 2021. Available online: <https://interbrand.com/best-global-brands/?filter-brand-sector=automotive> (accessed on 18 December 2021).
31. BMW Group. Sustainable Value Report 2020. Available online: <File:///C:/Users/korisnik/Downloads/BMW-Group-Bericht-2020-EN.pdf> (accessed on 18 December 2021).
32. Daimler, A.G. Sustainability Report 2020. Available online: <https://sustainabilityreport.daimler.com/2020/servicepages/downloads/files/daimler-sr-2020.pdf> (accessed on 18 December 2021).
33. Honda. Honda Sustainability Report 2020. Available online: <https://global.honda/about/sustainability/report/pdf-download.html> (accessed on 15 December 2021).
34. Hyundai. Sustainability Report 2020. Available online: <https://www.hyundai.com/worldwide/en/company/sustainability/sustainability-report/T1/textgreater{}> (accessed on 15 December 2021).
35. Toyota Motor Corporation. Sustainability Data Report 2020. Available online: https://global.toyota/pages/global_toyota/sustainability/report/sdb/sdb2008_en.pdf (accessed on 13 December 2021).
36. Honda Official Web Site. Available online: <https://www.honda.com/> (accessed on 15 December 2021).
37. Hyundai Official Web Site. Available online: <https://www.hyundai.com/worldwide/en/> (accessed on 18 December 2021).
38. Mercedes Benz Official Web Site. Available online: <https://www.mercedes-benz.com/en/> (accessed on 18 December 2021).
39. Toyota Official Web Site. Available online: <https://www.toyota.com/> (accessed on 18 December 2021).
40. BMW Official Web Site. Available online: <https://www.bmw.com/en/index.html> (accessed on 18 December 2021).