

## An Exploratory Discussion on Electric Cars and Sustainable Innovation

**Hiroko Oe<sup>1\*</sup>, Mohd Noman Abdullah<sup>2</sup>**

The Business School, Bournemouth University  
89 Holdenhurst Road, Bournemouth, BH8 8EB, UK  
Email: hoe@bournemouth.ac.uk

### **Abstract:**

*This study provides an exploratory discussion to reveal the authors' perspectives regarding previous academic discussions. In combination with the development of innovative environmentally friendly products, electric vehicles will continue to be an important research topic in the field of innovation. Currently, given the unprecedented challenge of COVID-19, humanity has been charged with the task of developing sustainable business strategies and promoting environmentally friendly business practices. The research surrounding electric vehicles, an important example of innovation, has been enriched by many academic discussions, but it remains important to critically evaluate the development concept of electric vehicles from the perspective of innovation novelty, to examine the factors that support the innovation and to identify issues for future discussions and research. Accordingly, this exploratory study unravels the debate on innovation surrounding electric vehicles and proposes several key issues for future research. Electric vehicles are a new product characterised by two major features – innovation and sustainability – and their development is coupled with a growing interest in environmental issues. Based on the authors' observations, this study identifies the key factors that support the growth of the industry and presents arguments for reconciling the themes of research and development acceptability and sustainability. It is hoped that the key issues presented in this paper will serve as an effective guide for future research.*

### **Keywords:**

*exploratory discussion; electric cars; sustainable innovation*

## **I. Introduction**

### **1.1 Background of the Study**

Sustainability has likely never been as popular as it is today. Many companies advocate for it, and with the emergence of environmental issues, striving for sustainability is both a corporate responsibility and a duty of global citizens. At the same time, there is neither any clear and unified definition of the concept nor an agreed-upon plan to achieve it.

Despite these difficulties, there is a shared understanding that sustainability is a central theme in business initiatives and in the development of new ideas, innovations, products, services and new social frameworks. Some intellectuals limit sustainability to ecological issues, while others use it synonymously with corporate social responsibility (CSR). This paper clarifies the significance of manageability by showing that conservatism is distinguished from obligations and other comparative concepts by the concept of 'time' (Bansal & DesJardine, 2014).

With the integration of non-industrialised countries into the world economy, there has actually been an increased interest in oil, which directly affects market prices as a result of the basic monetary law of interest (citation). The volatility of oil and energy prices is forcing governments and businesses to search for novel solutions, and such innovations have the potential to significantly advance the world (citation needed). This study will focus on electric vehicles and discuss consumer interest, market size trends and efforts to address unknown levels of exchange in the near future.

No company can continue to grow by sticking to old-fashioned beliefs. Intense competition at home and abroad is one of the most important effects of globalisation on the world economy, with markets that were once delineated by borders in the past now being seamlessly linked (citation needed). Businesses today face challenges caused by the resulting competition, including the need to function in markets with varying standards for product quality, production technology, technological advances and marketing (citation needed).

### **1.2 Rationale and the Purpose of this Study**

The impact of manufacturing on the environment is another challenge that companies, especially multinationals, must overcome. The current hypothesis states that greenhouse gas (GHG) emissions will increase by 45% by 2030 under a laissez-faire economy (citation). There is concern that this will result in a 6% increase in the global average temperature, which is argued to result in a loss of about 5%–10% of GDP in the economy worldwide, with a loss of over 10% of GDP for the most unfortunate countries (citation needed).

The main driver of the market transition to green technologies is not instability of value; in fact, a variety of situations have brought about negative climate impacts and an accompanying societal shift toward conservation. Organisations create new jobs and generate financial outcomes. However, if they fail to act responsibly, they pose a threat to society and the environment. CSR can reduce corporate harm by encouraging socially responsible and ecologically beneficial business practices. The basic idea is that the adoption of new innovations requires fundamental change, and this applies at both the organisational and cultural levels (Söderholm, 2020).

The task and objective of this study is to help reconnect the relationship between the global environment and corporate behavior and reorganise the guiding principles and framework for economic behavior to address environmental issues.

Firms' creation processes are influenced by inherent challenges and customer support for, or aversion to, these issues. Although green concepts are likely to become more common in the future, the question should be asked as to what devices are needed to solidify this cause and integrate it with the spirit of society as a whole. Finding an answer to this proposition is the primary interest of this study's discussion.

## **II. Review of Literature**

### **2.1 Electric Vehicles and Environmental Issues**

Global companies are currently investing in research in development (R&D) but have a bias towards green solutions. Today's civilisation must deal with a variety of natural problems, including environmental change, severe atmospheric degradation, modern waste and significant air pollution. Green and sustainable power should be considered as one of the key changing factors in managing and reducing climate impacts. Electric vehicles offer an

opportunity to mitigate a significant portion of these impacts by providing effective transport with electrical energy. The growing consumer preference for green innovations is primarily, but not exclusively, the result of unfavourable environmental changes brought about by multinational corporations. Eco-efficiency and environmentally friendly decisions are being considered by organisations as an important source of change and planning. Numerous companies from various industries, from agriculture to automobiles, are beginning to invest in these areas. However, more than 90% of the global transportation sector still runs on energy derived from petroleum (Khalili et al., 2019).

## 2.2 Digital Transformations

Organisations are tied to the social and environmental fabric of the planet. Therefore, ecological challenges are also financial challenges. Digital transformation involves the evolution of a company's various operations through computer-based innovation to increase productivity, foster organisational culture and improve operational efficiency. Tough competition exists in the marketplace, and companies must adapt to rapidly changing customer demands. To meet customer expectations and improve the customer experience, the distribution of information and rapid decision-making through digitalised operations are critical lifelines for companies (Amirul et al., 2023).

Mercedes-Benz's collaboration with startup Circular to measure the amount of materials used in its battery supply chain and the amount of harmful substances emitted into the environment is a good example of how digitalisation has enabled the capture of information to support corporate sustainable behavior (The Mercedes-Benz EQS Delivers Sustainability, n.d.). With the recent rise in global environmental issues, stakeholders have become more sensitive to ecological issues, and, as companies are expected to act in an environmentally conscious manner, consumers are also being encouraged to purchase environmentally friendly vehicles (Bhutto et al., 2022).

Megatrends in the automotive industry are powerful drivers of innovation. Currently, they include independent vehicle capabilities, the interoperability of data from related vehicles, vehicle sharing initiatives, selective vehicle on-request driving and efficient and environmentally friendly automated driving controls, all accelerated by the automotive industry's shift towards electric vehicles (Ling & Wang, 2004; Wicki et al., 2022).

Electric vehicles and the associated innovation have accelerated these trends, especially as their production has expanded. The transition to electric vehicle manufacturing has made some operations repetitive, rendering traditional automotive system creation procedures obsolete. The automotive industry is also inextricably linked to information technology, with manufacturers working with programming development companies. Now, the automotive industry appears to be unable to communicate without the implementation of information strategies and technologies. Modern intelligent cars collect information about drivers, traffic patterns and preferred destinations, and the behavioural data of individual drivers and congestion information are useful as large-scale data for artificial intelligence-based predictions (Gaur & Sahoo, 2022). However, to protect driver data, it is important to secure the associated systems. For this reason, manufacturers are constantly looking for new safety and health measures, resulting in a new set of challenges and missions for the intelligent car industry. The possibilities and prospects for digital transformation are more readily apparent when viewed from the perspective of social responsibility.

### **a. Improving Environmental Impacts**

Computer-based business innovations, to a greater or lesser extent, contribute to reducing a company's environmental impact. Paperless operations are facilitated by digitalisation arrangements, such as advanced electronic signatures and electronic invoicing. This small change could have a big impact in helping reduce CO2 emissions, conserve water and save trees used as raw materials for paper (Mudliar, 2022). There is still a close relationship between supportability and CSR, and the paperless environment is a good example of the environmental benefits of digital transformation (Chang et al., 2022).

### **b. Ensuring Transparency and Fighting Fraud**

Companies that promote business strategies based on best practices in CSR are more likely to take a sound moral approach. In other words, the cornerstones of CSR reflect important moral strengths and lead to the commitment to and disclosure of preferred ethical behavior patterns (Jeet, 2022). Using electronic contracts, a signer can be clearly identified, the signed record is irreversibly fixed, and the deal is usually made public in accountability situations. Electronic signatures, in conjunction with open systems, can thus prevent companies and sellers from participating in fraudulent valuation rehearsals. The blockchain-based identification of producers and public disclosure of raw materials are precisely the kind of measures meaningful for winning the trust of consumers (Baah et al., 2021).

## **2.3 Open Innovation and Business Model Innovation**

Open innovation is a style of innovation in which a company integrates and uses a variety of external resources, including competitors, outside offices and even the public, to advance a product, service, action plan or process (Naqshbandi & Kamel, 2017). Open development from within involves the influx of various ideas and expertise from outside an organisation to recognise, select, leverage and integrate ideas, matching novel information with internal information to co-create new value (Kalkhofer et al., 2022). Outbound development refers to the intentional commercialisation and use of internally generated ideas in the organisation's external environment. The concept is easier to understand in a diagrammatic way vis-à-vis inbound development. Outbound development is accomplished by intentionally leaking a product early to the press or advisors or by opening up an invention or new service to customers, who improve it by incorporating users' critical opinions (Carrasco-Carvajal et al., 2022).

Business model innovation, on the other hand, is the practice of changing an organisation's underlying operating model for its customers in a way that provides it an advantage over its competitors. Generally, it leads to greater success is the external search for and combination of information on open expansion. However, care must be taken in selecting potential open expansion partners. To identify the best of several open advancement partners, it is important to determine how they can contribute to promoting conservatism and financial development (Nath & Siepong, 2022).

Sustainability is a growing focus of organisational progress, with companies aiming to achieve environmentally sound performance while still pursuing competitive advantage (Sahoo et al., 2022). However, in reality, companies are not very good at taking into account the nuances of the actual item development process and the importance of the environment to the company. Development may inspire more socially responsible projects, but it is unclear whether social responsibility will necessarily be fulfilled as a result. There is an urgent need to address socio-environmental issues. At the same time, it is absolutely imperative that development be used to support and enhancing existing ways of life.

### III. Research Methods

#### 3.1 Research Target

People and companies innovate by taking advantage of the different opportunities that technology offers. Technology serves as the foundation for all innovation and can also be an effective tool (Kylliäinen, 2019). As mentioned earlier, the term ‘sustainability’ covers a diverse and broad spectrum. It affects economic and social activities through the actions, decisions and behaviour patterns of companies, but it is not easy to define (Caputo et al., 2021). Sustainability is as significant in the automotive industry as in other industries. Stricter sustainability guidelines and the demand for change by customers and financiers will require innovation. Progress in the automotive industry has been built on innovation and novel strategies at different levels of development, including vehicle and technology development.

#### 3.2 Research Approach

Based on the discussions on innovation and sustainability in academia to date, this study focuses on the interplay between innovative business behaviour surrounding the development of electric vehicles and the factors that cannot be overlooked in ensuring their innovativeness. The study aims to organise preliminarily viewpoints so as to identify issues for further refined empirical research based on primary data.

### IV. Discussion

Even though it is well understood that innovation is a fundamental step in development, many automakers have first and foremost paid attention to shared key issues, such as reducing vehicle sway, making vehicles quieter and better machine development and improvement (Demirbag & Glaister, 2020). Through the globalisation of R&D, companies in the automotive industry have also sought to increase productivity by collaborating internationally, tirelessly sorting through ideas for progress and implementing new technologies.

Underlying the current and continuing advances related to electric vehicles and other improvements is an understanding of the concept of broader progress in the global marketplace and the proposition of addressing environmental issues. The group of companies in the automotive industry sector, ranging from the large seasonal baths to small and medium-sized enterprises, now view R&D as a core competency (Yang, 2022). As argued by Dachs & Zahradnik (2017), the globalisation of R&D capabilities among electric vehicle firms has improved their development, effectiveness and productivity. The globalisation of R&D, in combination with the economies of scale brought about by international collaboration, also reduces geographic duplication and waste, leading to lower costs. For example, Volkswagen and Tesla could attract fresh talent and ideas by creating R&D centres in other countries with lower labour costs, leading to a higher penetration of electric vehicles (Rajaeifar et al., 2022).

In addition, the globalisation of R&D capabilities will spark interest in new talent to move away from the limited quantity and quality of skills available in the domestic market (Frynas & Mellahi, 2019). Different approaches to decentralisation are used in electric vehicle organisations, including ethnocentric centralisation, geocentric unification and polycentric decentralisation. Electric vehicle manufacturers also have unique R&D strategies depending on their characteristics. Some aim for extremely decentralised R&D, some aim for ad hoc and fuzzy development without a specific focus, and some aim for competition among autonomous R&D units. At the same time, all believe that innovation through R&D is indispensable for the evolution and growth of the industry, in line with the mission and policies of each company.

## V. Conclusion

### 5.1 Contribution

The important topic of electric vehicle innovation is currently attracting many researchers. The present study critically evaluated the concept of electric vehicle development from a novelty of innovation perspective, examining the factors that support the innovation and organising the related issues to form a proposal for future discussions and research. The electric vehicle is a new product that combines innovation and sustainability as its two main features, and its development is closely tied to the growing interest in environmental issues. Based on the authors' and others' perspectives, this study identified key elements that support the industry's growth and presented arguments for balancing R&D acceptability with sustainability. It is hoped that the key issues proposed by this paper will serve as a useful guide for future research.

### 5.2 Limitations and Further Research Opportunities

This study is an exploratory discussion paper that reveals author's perspective based on the previous academic discussions. We fully recognise the need to examine the issues presented in this paper through an empirical analysis using primary data. Combined with the process of developing environmentally friendly innovative products, electric cars will continue to be an important research topic in the field of innovation. In this context, we plan to use survey data on electric vehicle R&D, entrepreneurs and consumers to present further concrete suggestions through an empirical analysis, such as on what attributes of electric vehicles are supported.

## References

- Adnan, N., Nordin, S. M., Rahman, I., Vasant, P., & Noor, M. A. (2018). An overview of electric vehicle technology: a vision towards sustainable transportation. In *Intelligent Transportation and Planning: Breakthroughs in Research and Practice* (pp. 292-309). IGI Global.
- Amirul, S. R., Ahmad, S. N. B., & Nasip, S. (2023). Organisational Culture and Dynamic Marketing Capabilities in the Digital Age of Pandemic Crisis. In *International Conference on Business and Technology* (pp. 317-331). Springer, Cham.
- Baah, C., Acquah, I. S. K., & Ofori, D. (2021). Exploring the influence of supply chain collaboration on supply chain visibility, stakeholder trust, environmental and financial performances: a partial least square approach. *Benchmarking: An International Journal*, 29(1), 172-193.
- Bansal, P. and DesJardine, M.R. (2014). Business sustainability: It is about time. *Strategic Organization*, [online] 12(1), pp.70–78. doi:10.1177/1476127013520265.
- Bergek, A., Jacobsson, S., Carlsson, B., Lindmark, S., & Rickne, A. (2019). Analyzing the functional dynamics of technological innovation systems: A scheme of analysis. *Research policy*, 37(3), 407-429.
- Bhutto, M. Y., Khan, M. A., Ertz, M., & Sun, H. (2022). Investigating the Role of Ethical Self-Identity and Its Effect on Consumption Values and Intentions to Adopt Green Vehicles among Generation Z. *Sustainability*, 14(5), 3015.
- Carrasco-Carvajal, O., Castillo-Vergara, M., & García-Pérez-de-Lema, D. (2022). Measuring open innovation in SMEs: an overview of current research. *Review of Managerial Science*, 1-46.
- Chang, C. L., Octoyuda, E., & Arisanti, I. (2022, May). The Role of Digital Transformation on Strategic Leader: A Systematic Literature Review. In *2022 7th International Conference on Business and Industrial Research (ICBIR)* (pp. 289-294). IEEE.

- Charles Edquist (2017). Reflections on the systems of innovation approach. *Science and public policy*, 31(6), 485-489.
- Dachs, B. and Zahradnik, G., (2017). Recent trends in the internationalization of Business R&D - LSE Blogs. [online] Available at: <https://blogs.lse.ac.uk/gild/2017/10/09/recent-trends-in-the-internationalisation-of-business-rd/> [Accessed 18 August 2022]
- Frynas, J. G., & Mellahi, K. (2019). *Global strategic management*. Oxford University Press, USA.
- Gao, H., Zhang, T., Song, K., Niu, W., & Chen, H. (2019). Real-Time Testing Technology of Powertrain System in Proton Exchange Membrane Fuel Cell Electric Vehicles: A Review (No. 2019-01-0371). SAE Technical Paper.
- Gaur, L., & Sahoo, B. M. (2022). Introduction to Explainable AI and Intelligent Transportation. In *Explainable Artificial Intelligence for Intelligent Transportation Systems* (pp. 1-25). Springer, Cham.
- Hekkert, M. P., Suurs, R. A., Negro, S. O., Kuhlmann, S., & Smits, R. E. (2017). Functions of innovation systems: A new approach for analysing technological change. *Technological forecasting and social change*, 74(4), 413-432.
- Jeet, V. (2022). A Bird's Eye View of Corporate Social Responsibility Theoretical Framework. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 13(4), 1-12.
- Kalkhofer, H., Moosbrugger, N., Ulmer, A., & Dobler, M. (2022). Enable Service Interaction and Value Co-Creation for Small and Medium-Sized Enterprises Through an Innovation-Method-Framework. In *Smart Services Summit* (pp. 127-136). Springer, Cham.
- Ling, J., & Wang, J. (2004). Mega Trends of Automotive Industry and Evolution of Reliability Engineering. *SAE Transactions*, 113, 702-711.
- Malerba, F. (2017). Sectoral systems of innovation: a framework for linking innovation to the knowledge base, structure and dynamics of sectors. *Economics of innovation and New Technology*, 14(1-2), 63-82.
- Mudliar, S. L. (2022). Green Audit: A Step Towards Sustainable Environment. In *Sustainable Engineering, Energy, and the Environment* (pp. 371-377). Apple Academic Press.
- Nath, P., & Siepong, A. (2022). Green marketing capability: A configuration approach towards sustainable development. *Journal of Cleaner Production*, 354, 131727.
- Osterwalder, A., & Pigneur, Y. (2020). *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons.
- Rajaeifar, M. A., Ghadimi, P., Raugei, M., Wu, Y., & Heidrich, O. (2022). Challenges and recent developments in supply and value chains of electric vehicle batteries: A sustainability perspective. *Resources, Conservation and Recycling*, 180, 106144.
- Saebi, T., & Foss, N. J. (2019). Business models for open innovation: Matching heterogeneous open innovation strategies with business model dimensions. *European Management Journal*, 33(3), 201-213.
- Sahoo, S., Kumar, A., & Upadhyay, A. (2022). How do green knowledge management and green technology innovation impact corporate environmental performance? Understanding the role of green knowledge acquisition. *Business Strategy and the Environment*.
- Söderholm, P. (2020). The Green Economy transition: the Challenges of Technological Change for Sustainability. *Sustainable Earth*, [online] 3(1). doi:10.1186/s42055-020-00029-y.
- Siedschlag, I., Smith, D., Turcu, C., & Zhang, X. (2017). What determines the location choice of R&D activities by multinational firms?. *Research Policy*, 42(8), 1420-1430.

- Wicki, M., Brückmann, G., & Bernauer, T. (2022). How to accelerate the uptake of electric cars? Insights from a choice experiment. *Journal of Cleaner Production*, 355, 131774.
- Yang, Y. (2022). Capital Structure and R&D: Empirical Evidence from China and USA. *Modern Economy*, 13(4), 532-544.
- Zhao, F., Chen, K., Hao, H., Wang, S., & Liu, Z. (2019). Technology development for electric vehicles under new energy vehicle credit regulation in China: scenarios through 2030. *Clean Technologies and Environmental Policy*, 21(2), 275-282.