

# Scientometric analysis of the studies conducted in the field of electric vehicle business value creation based on articles indexed in WOS

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## Abstract

The aim of the current research is to analyze the scientific metrics of the studies conducted in the field of value creation of electric cars based on the studies indexed in WOS. In terms of the goal, the research is developmental, and its approach is scientometric; the most important authors and thematic clusters have been identified using the techniques of co-lexical and co-authorship of vocabularies; and it has finally led to the drawing of a scientific map in this field. 14235 scientific documents indexed in the WOS database during the years 1955 to 2023 have been analyzed as the statistical population of this research by relying on descriptive statistics and VOSviewer software. The upward trend in the publication of articles during the last 68 years has been one of the findings of this research (the largest number of articles was published in 2021 (2258)). With the investigations carried out, the evolution of key words from the attention of engineering and operations and production management to the field of clean transportation towards the movement of countries towards optimization was observed, using computer science in the direction of sustainable development with the formulation and implementation of effective strategies by the government. The analysis of the thematic clusters of this study has shown that examining the effects of electric vehicle technology and formulating incentive strategies by governments are among the areas of interest for researchers in recent years. This framework can be used for a better understanding and more effective use of the electric vehicle development model with more value creation in the sustainable development of electric transportation.

## Keywords:

Electric cars,  
Value creation,  
Scientometrics,  
Co-lexical occurrence,  
Co-authorship analysis

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## **Extended Abstract**

### **Introduction**

The transportation sector accounts for about 28% of the global final energy demand, 65% of the global final oil energy demand, and 24% of the global greenhouse gas emissions; of which 77% belongs to road transportation. The road transport sector, the least diverse final energy consumption sector, relies almost entirely on fossil fuels at over 95% (Zimm, 2021). In 2017, as one of the largest producers of fossil gases in recent years, Iran is affected by inefficient energy consumption, which plays a significant role in the global emission of greenhouse gases (Jiang et al, 2020). The emission rate of pollutants caused by the traffic of traditional road transport vehicles in Iran is 47%, which has caused a significant increase in the level of air pollution in urban environments (Bidva and Hasanzadeh, 2018). Therefore, electric cars have become a political goal; it is necessary to focus on future-oriented innovations in the production of electric vehicles in order to resolve political concerns (Di Felice et al., 2021). Often, these problems are not caused by the development or technology itself, but environmental problems are caused by not paying attention to the side results and incorrect application of industry and technology (Abdi et al, 2024). Therefore, organizational value creation is the requirement for an effective and useful response to these changes; the development of technology and gaining a competitive advantage from the opportunities resulting from them (Ajalli, 2023). Value creation is a lofty goal in business and means an approach that an organization takes towards all its stakeholders and especially its customers, in which it puts the customer at the center of all its activities and processes. In this sense, in today's highly competitive environment, there are organizations that are aware of the needs of customers and their surroundings, and identify opportunities faster than competitors and take advantage of them (Qanbarzadeh, 2021). Based on this, it is important to review the research literature and draw a scientific map to review the development of electric vehicles. The analysis of social networks is known as a systematic method that presents a sociological paradigm by analyzing keywords; and it also enables the possibility of identifying scientific collaboration networks by analyzing network nodes and communication lines between them and determining the joint authorship of researchers and co-authorship of countries (Darvish et al, 2018).

### **Theoretical literature**

Todorovic et al, (2023) found, by evaluating the number of scientific publications related to the transition and conducting scientometric and literature analyzes, that there are general concerns about safety, sustainability, environmental effects, and ecological footprint. Although there is dominance in the areas related to technical evolution of electric and self-driving cars, the increasing growth of various fields of research, including artificial intelligence, is evident. This study shows that progress in artificial intelligence technology, innovation in business models and regulations, as well as continuous and comprehensive integrated studies should be considered.

Kovačić et al, (2022) in a research entitled the new paradigm of sustainable urban mobility showed that the use of electric and self-driving electric vehicles is one of the optimal solutions to reduce noise pollution or pollution caused by the operation of internal combustion engines, and transformation and development of planning methods is essential to increase their sustainability.

Sayadi et al, (2024) identified and prioritized the obstacles to the promotion of electric cars in Iran in a research, taking into account the special conditions of the country's automobile industry. The obtained results showed that infrastructural barriers, creative destruction

barriers, supply side barriers, and demand side barriers are the most important barriers to promoting electric cars in Iran.

Sheikhi et al, (2021) in a research to identify the key factors affecting the promotion of green innovation capabilities in the automobile industry showed that the key factors of stakeholder pressure and legal requirements, green research and development, green product innovation, and sustainable network collaborations respectively have the greatest impact on promoting the capabilities of green innovation in the automobile industry; senior managers and policy makers of the automobile industry should pay special attention to this category of capabilities and strive to strengthen these factors.

### Research methodology

The research is descriptive in terms of its purpose and developmental in terms of the type of use, which was carried out with the help of scientometric techniques along with co-lexical and co-authorship analysis. The community of this research includes all the scientific productions carried out by the world's researchers in the field of electric vehicles, whose research results have been indexed in the Web of Science database during the years 1955 to 2023. Therefore, the search in the core collection section of the WOS database was conducted on January 6, 2023 without time limit in order to collect the data and retrieve the records needed for this research (search method: Electric vehicle, publication field: Title), which out of 1168 keywords related to 13093 articles with 151 keywords that were repeated at least 3 times were identified and selected as basic keywords. Co-lexical and co-authorship analyzes of the subject area were done with the help of VOSviewer software, and data analysis was done using Excel software.

### Research findings

The results of the topic search conducted in the WOS database in the last 68 years led to the recovery of 14,235 sources in the field of electric vehicles, of which 99.038% of the mentioned researches were published in English. The results indicate that in the last few years, since 2020, the governments have sought to create the necessary infrastructure for the development of electric vehicle technology by formulating and implementing appropriate strategies. With the issue of electric cars in scientific sources, great emphasis has been placed on the development of incentive strategies by governments and their implementation in order to achieve sustainable production and environmentally friendly consumption.

### Conclusion

The current research was conducted with the aim of scientometric analysis of the studies conducted in the field of electric vehicle business value creation based on the studies indexed in WOS. The results of this research are consistent with the results of Wang et al, (2019), Kubiczek and Hadasik (2021), Khan et al, (2020), Pelegov and Pontes(2018), Foster et al, (2018), and Rietmann and Lieven (2019). The results of the research showed that the environmental and energy security issues have prompted governments to provide many incentive policies to promote electric vehicles with the aim of promoting sustainable and environmentally friendly mobility, reducing resource wastage and increasing value creation. Due to the fact that Iran's traditional automotive industry is not able to keep pace with the global automotive industry because of its deep backwardness, and based on the results of the research, it is suggested to refrain from huge investments in the field of ordinary cars; and instead, put the development policy of the electric automotive industry on the agenda of the government. In order for the automobile industry to become a leading sector in the national economy, it is necessary to change the government's approach from the traditional automobile

industry to the support of electric automobile manufacturing. The government should put incentive programs for the development of the market in the initial stage of the electric vehicle industry. Continuous monitoring of the country's progress in the area of new technologies in the field of electric vehicles and persuading universities and research institutions to create capacities for electric vehicle technological innovations can be effective.