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## Innovation model analysis of new energy vehicles: taking Toyota, Tesla and BYD as an example

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### Abstract

As one of seven strategic emerging industries, new energy vehicle industry has great significance in China's economic growth and environmental protection. In this paper, taking Toyota, Tesla and BYD as examples, innovative models of new energy vehicles are analyzed. The paper analyzes and compares mainly innovation of the ecological environment, market positioning, innovation path and business model, drawing the following conclusions: Toyota adopted innovative symbiosis strategy that by the use of complementary resources of global relevant enterprises, it made optimized configuration in the global, and built enterprise ecosystem to make progressive disruptive innovation and develop the middle and low-end market; Tesla in a better environment for innovation among the best in the world standing on the forefront of technology innovation environment, quick disruptive innovation, the first to lead the high-end demand, and then to low terminal extension is Tesla's business model. BYD in Shenzhen, a good ecological environment of innovation, through cooperation with domestic and foreign, to niche-based, open platform for product innovation is formed by a plurality of core technologies capture gather after the adoption of the platform innovation resources in connection with the comprehensive remodelling expansion, continued low-cost, high-strength, integrated, open innovation, products are mainly targeted at low-end market.

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### 1. Summary of new energy vehicle innovation model

The United States studied mainly from the industrial theory and policy, and focused mainly on electric vehicles

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and hydrogen fuel cell vehicles. Fred Joseck, the U.S. Energy secretary, on the basis of generalization and summation of the special plan for hydrogen fuel cell vehicles and electric vehicles, thought that although there were some questions on research projects as well as the main direction of development of new energy vehicles in the United States, it gradually form development pattern that took the enterprises as the main part and government supported mainly<sup>[1]</sup>. Hasishi Ishitani, from the perspective of policy system, the overall strategy and the strategic objectives, researched Japanese hybrid electric vehicles and thought that Japan basically formed a development system of new energy vehicle which guided by the government and participated in by the whole society<sup>[2]</sup>. In our country, the scholars mainly studied the innovation ability evaluation, patent analysis, government policy support, etc. of new energy vehicles. Liu Lanjian and Chen Shuangbo based on analysis of Chinese new energy vehicle technology innovation policy, proposed new energy vehicle innovation model which was based on multi-loop competition, analyzed several ways to promote the advancement of technology, and proposed the policy system of supporting multi-loop competition model system implementation<sup>[3]</sup>. Wang Zhiqi et al. taking hybrid vehicles as an example, with patent data in 20 major technical fields as samples, using the method of input-output analysis identified the field of foreword technology and core technology, and analyzed the development trend of key technology areas<sup>[4]</sup>. He Zhengchu et al. established evaluation model based on analytic hierarchy process (AHP) and fuzzy evaluation method, evaluated and analyzed selectively the development of new energy vehicles industry in Hunan Province<sup>[5]</sup>. Chen Zhaofeng believed there were some problems on our strategic emerging industries, including Low-end links excessive competition, low accumulation capacity to independent innovation and overly participating by the government and so on and thought that by the Global Value Chain (GVC) value chain model to the countries in transition and the forming GVC NVC high-end competitive advantage were important strategic innovation of Chinese strategic emerging industries<sup>[6]</sup>. Liu Jianhua and Jiang Zhaohua taking Henan Province as an example, built evaluation index system of traditional industry innovation driven, transformation and upgrading, and constructed an analytical framework and innovation strategies of strategic emerging industries patent technology<sup>[7]</sup>. This paper studies from the perspective of the new energy vehicle innovation patterns, and analyzes innovation of the ecological environment, market positioning, innovation path and business model of Tesla, Toyota and BYD which are representative new energy auto enterprises of U.S. Japan and China.

## 2. Illustrations

The world economy has entered a post-crisis era, the strategic emerging industries has become a powerful engine to achieve industrial restructuring. Wu Hang, from the perspective of innovation ecosystems, explained the meaning of the ecosystem, and from three aspects of innovation cluster development, collaborative innovation, and ecological environment construction proposed the development of strategic emerging industries<sup>[8]</sup>. Li Lei, Guo Yanqing through the analysis of new energy vehicles in the United States, Japan and Europe's development, pointing out that China's development of the urgency of the task of new energy automotive industry, the primary task of the development of new energy vehicle industry is innovation, combined with the theory of innovation ecosystem constructing new energy automobile industry innovation ecosystem model, and carried on the comprehensive analysis<sup>[9]</sup>.

The automotive industry is a global technology and capital-intensive industries, product development and investment in fixed assets is very large, significant economies of scale. Toyota currently has 50 manufacturing facilities in 27 countries and regions around the world, and more than 160 countries worldwide car sales. This provides conditions for the integration of the global Toyota's new energy vehicle innovation resources, Toyota created a good innovation environment by the way of cooperating with local universities, enterprises and research institutes to establish research institutions in various regions, or by other ways. Toyota motor vehicles jointly Nissan, government agencies, foreign enterprises and other domestic and foreign institutions set up the Japanese electric vehicle alliance. Taking the Toyota in the United States as an example, Toyota and GM Group worked on automotive safety research together, and spend billions of dollars establishing The Research Institute (TRI) in the United States, Toyota Research Institute and Stanford University, Massachusetts Institute of Technology and the University of Michigan in cooperation to develop the automatic driving technology and artificial intelligence research. Starting from the enterprise business processes, the research and development, sales and service in the global scope of the optimization of the allocation, to build innovative symbiotic strategic ecosystem.

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