

Research on the Failure Avoidance of Green Technology Innovation of New Energy Vehicle Enterprises

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Abstract: New energy vehicle, as a key emerging industry in China, are an important way to alleviate the energy crisis and take the road of green technology innovation. However, there are always some problems such as inadequate research and development of core technology, waste of resources, and low conversion rate of achievements. Taking the new energy automobile listed company as the research object, a two-stage SBM-DEA model is constructed to measure the efficiency of green technology innovation in China from the two stages of technology research and development and achievement transformation. Combined with the difference of innovation efficiency in different stages, the failure phenomena of green technology innovation process are analyzed. Finally, the innovation failure avoidance measures are put forward according to the development status of new energy vehicles.

1. Introduction

As a manufacturing country, China plays an important role in the development of global manufacturing industry. Since the founding of New China, especially the reform and opening up, manufacturing industry has developed rapidly, but compared with the world's level, it is not competitive in terms of independent innovation capabilities, resource utilization efficiency, industrial structure level, informatization degree, and quality. A series of problems also occurred in terms of resource consumption and environmental pollution [1]. As emerging industries competing for development in various countries, new energy vehicle is an exploration of the green transformation of the automotive industry, and have gradually become the core content of technological innovation and development. That has also provided an opportunity for China to achieve overtaking in the industrial economy. At present, China continues to increase investment in research and development of new energy vehicle, but there are still problems such as insufficient research and development of core technologies, waste of resources, and low conversion productivity. Especially under the background of the decline of government subsidies, the profits of some new energy vehicle companies have begun to decline, and the innovation process has seriously failed. Therefore, it is of great theoretical and practical significance to explore the failure phenomenon of

green technology innovation process and take reasonable measures to avoid the failure of innovation. These will promote the successful transformation of green technology innovation and realize profitability of enterprises.

2. Model and Data Description

At present, most literatures regard the innovation process as a "black box" for research, and ignore the characteristics of different stages of technological innovation, which is not conducive to discovering problems in the technological innovation process [2]. This article combines the development characteristics of new energy vehicle enterprises and the current status of technological innovation, and divides the process of technology innovation into two stages: technology research and development and achievement transformation. By measuring the technological innovation efficiency of decision-making units and finding invalid decision-making units, we can then explore how these decision-making units can be improved in terms of input or output and the direction and extent of improvement.

The purpose of new energy vehicle companies is to ensure energy conservation and environmental protection to the greatest extent while ensuring the interests of the company. In recent years, in recent years, the cars produced have been designed to reduce fuel consumption as much as possible and strive to achieve energy conservation and environmental protection. Therefore, this article believes that the main purpose of new energy vehicle companies for research and development is to improve green technology innovation and production capacity. The input of technological innovation mainly includes two indicators of R&D personnel and R&D expenses. The "technical staff" in the annual report of the company is selected to measure the number of R&D personnel, and "R&D expenditure" represents the investment in research and development costs. Gordon and Russell believe that intangible assets are important technological innovation asset for an enterprise [3-4], so "intangible assets" are selected as intermediate output indicators. In addition, patents as the main output of the research and development stage can effectively measure green research and development capabilities. Therefore, the number of patent applications is selected as the output intensity measurement index at this stage. Taking the intangible assets and new patents as the input for the second stage, and the main business income and net profit are selected as the final output of green technological innovation.

3. Results and Failure Analysis

Through a comparative analysis of the technological innovation efficiency of different niche companies, it is found that in the new energy vehicle industry, the technological innovation efficiency of battery material companies is relatively high. The efficiency of achievement conversion in vehicle companies is significantly lower than the efficiency of technological research and development. Power battery companies and charging facilities companies have low technological innovation efficiency and lag behind the development of new energy vehicle industry. Power batteries directly determine the endurance of electric vehicles, and the construction of charging facilities is of great significance for the application and promotion of new energy vehicles. If the charging facilities fail to meet consumer demand, it will have a strong constraint on the development of the new energy vehicle industry.

3.1 Input failure

The study found that in the sample companies, 152 companies were non-DEA effective, accounting for more than 90%, of which 51 companies had redundant technical staff, 91 companies

had redundant R & D costs, and 89 companies had patent output insufficient. Among non-DEA effective companies in battery materials and electric motor control, the number of patent applications is far greater than intangible assets. Combined with the related research of enterprises, it is believed that this difference may be due to the weak independent R&D capabilities of enterprises and the inability to convert R&D investment into patent results. In the process of technology research and development, the company lacks innovation awareness and capacity, and there are always input failures such as insufficient use of input resources, insufficient technical output, or not up to standard of technical output.

3.2 Policy failure

The study found that the government began to reduce subsidies for new energy vehicles since 2017, which led to a substantial decline in profits for many companies. The decline of government subsidies has caused some uncompetitive enterprises to suffer a greater negative impact. Battery materials and power battery enterprises are greatly affected by the decline of subsidies. As the core component of new energy vehicles, power battery accounts for nearly 40% of the cost in the whole vehicle. The decrease of subsidies for new energy vehicles has led to the sharp price reduction of vehicle enterprises, while vehicle enterprises try to transfer the pressure of price reduction to power battery enterprises, forcing them to reduce prices. However, the prices of upstream raw materials lithium and cobalt have always been at high levels or even rising, causing midstream battery material companies and downstream power battery companies to face "two-way squeeze", which is in a dilemma of development, and profits have also been affected.

3.3 Market failure

The intellectual property rights accumulated in the early stage were not fully utilized in the stage of achievement transformation. 150 enterprises have redundant patent investment, among which power battery and electric motor control enterprises have a large number of invalid patents. As a strategic emerging industry, new energy vehicles are not mature enough to fully convert patented technologies and related intellectual property rights of new energy vehicles into market achievements. In addition, a large number of new energy vehicle enterprises lack of revenue, and even more enterprises have negative growth, especially some inexperienced enterprises have worse profitability, which indicates that there is market failure in the process of technological innovation. It shows that technological achievements can't be converted into productivity, the market recognition of innovation achievements is not high, and innovation achievements do not have strong competitiveness.

3.4 Service failure

Although vehicle enterprises and vehicle technology are important in the new energy vehicle industry, the facilities and services supporting is also crucial. The efficiency of technical innovation of power battery enterprises is around 0.25. There are still big problems in terms of battery life, safety performance and battery life. At present, the life cycle of power battery is 3-8 years, while the service life of traditional fuel vehicles is as long as 10 years. Moreover, the lack of annual inspection system for electric vehicles in China, and the lack of control over the safety and effectiveness of batteries have brought many potential safety hazards, even quality problems such as spontaneous combustion of electric vehicles, which has become an obstacle to the development of new energy vehicles.

4. Failure Avoidance Measures

Aiming at the failure of the green technology innovation process, the following avoidance measures are proposed.

(1) Reasonably invest innovation resources and explore new technological breakthroughs

The development of new energy vehicle industry needs high-level experts to drive the whole innovation process. Therefore, enterprises should reasonably adjust the proportion of R&D personnel and fully mobilize the enthusiasm and creativity of R&D personnel. The technology R&D efficiency of power battery enterprises is the lowest in the whole industry chain, so it is an important way to find a new breakthrough point of battery technology and improve the original disadvantages to improve the overall technology innovation efficiency and improve the investment failure phenomenon.

(2) Adjust the mode of government subsidy and establish the mechanism of supervision and punishment

We should make rational use of government policy tools and give full play to the leading role of the government [5]. The government needs to reduce the risk of new energy vehicle enterprises engaging in green technology innovation through various subsidy mechanisms, so as to promote the development of new energy vehicle enterprises. In addition, we also need to establish a regulatory mechanism to supervise the technological innovation process, and at the same time, we should adopt a strict punishment mechanism.

(3) Improve market recognition and promote green consumption concepts

An important cause of market failure is insufficient market demand and low consumer acceptance. Therefore, in addition to subsidizing consumers, we should also focus on market promotion to make the concept of green environmental protection popular. Based on these, it can promote the development of new energy vehicle industry from the consumer side and provide power for green technology innovation.

(4) Coordinated development of new energy vehicle industry chain

In order to promote the better development of the new energy vehicle industry, all stakeholders in the industry chain need to participate together. On the one hand, vehicle enterprises can expand their business types and occupy more and more complex niche in the industrial chain. On the other hand, vehicle enterprises can also cooperate with upstream raw material enterprises such as battery enterprises, so as to improve R & D efficiency, reduce information and resource losses, save costs, and promote the common development of new energy vehicle industry.

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