

From Lagging Behind to Leading: The Lithium Battery Sector in China -the Study on the Industry Catch-up Mechanism of CATL

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Abstract. Under the background of the evolution of the new energy vehicle industry and the lithium battery industry, this research takes Contemporary Amperex Technology Co. Limited as the case study object and utilizes the three-step coding method of grounded theory to analyze how it, achieving the leap from being a latecomer to a leader through policy support and its own management catch-up strategies. And this research explores the driving roles of some factors such as government policy guidance, enterprise technological innovation management, supply chain integration management, and talent strategy management in the process of Contemporary Amperex Technology Co. Limited' catch-up, providing a reference for other latecomers to achieve catch-up in the dynamic industrial environment.

Keywords: CATL; Lithium battery industry; Grounded theory; Catch-up mechanism; Enterprise management.

1. Introduction

In the background of global resource transformation and the increasing awareness for environmental protection from people, the new energy vehicle industry is booming. Lithium batteries, as a vital component in the production of new energy vehicles, have attracted the attention and concern of various countries. China's lithium battery industry is in a latecomer position, however, in recent years, a number of leading enterprises such as CATL have emerged, achieving a leap from catching up to leading. The success of CATL is not only due to technological progress, but also relies on its management mechanism for catching up. This research will, from the perspective of enterprise management, apply grounded theory to explore the industry catching-up mechanism of CATL, providing reference for relevant enterprises.

2. Literature Review

2.1 Evolution of the New Energy Vehicle Industry and Lithium Battery Industry

The new energy vehicle industry has gone through a process from infancy to rapid development. In the early stage, it was limited by factors such as technology and cost, resulting in slow growth (Yuan et al., 2015). Blomgren (2016) shows that with technological breakthroughs and policy support, the industry scale expanded rapidly. He et al. (2022) illustrate that the lithium battery industry, as the core element of development of the new energy vehicle, has continuously iterated its technology, and the battery storage capacity and safety performance have continuously improved. In Asia, the industry landscape has gradually shifted from being dominated by Japanese and South Korean enterprises to a competitive situation among China, Japan, and South Korea (Chen et al., 2022).

2.2 The role of policies in industrial development

Since the Chinese government proposed the goals of carbon peak and carbon neutrality, the automotive industry has faced severe challenges such as the depletion of traditional energy resources and environmental pollution, which have provided opportunities for the rise of new energy vehicles. Among the numerous core technologies of new energy vehicles, lithium batteries hold a crucial

position, accounting for over 30% of the total cost of new energy vehicles, and play a direct role in the development process and quality level of new energy vehicles (Gong & Hansen, 2023).

The research by Hu et al. (2022) also demonstrate that in 2020, the installed capacity of new energy vehicle batteries in China successfully rose to 63.3 GWh, and the market size reached 61.184 billion yuan. These achievements in Chinese new energy vehicle lithium battery industry are mainly attributed to a series of policy measures formulated and implemented by the country to promote the development of this industry.

2.3 Research on the Mechanism of Enterprise Catch-up

The enterprise catch-up mechanism includes numerous aspects such as technological innovation, organizational management, and market expansion (Wei et al., 2020). Armstrong & Fukami (2009) also discussed that latecomer enterprises learn from the experience of advanced enterprises and innovate based on their own advantages to achieve the improvement of technology and management level.

3. Research Methods

3.1 Grounded Theory

Grounded theory emphasizes starting from actual data and through systematic coding and analysis, extracting concepts and theories. This study adopts the three-step coding method of grounded theory, namely open coding, axial coding, and selective coding, to analyze the collected data in order to reveal the industry catching-up mechanism of Contemporary Amperex Technology Co. Limited.

3.2 Data Collection

The data sources of this study mainly include official reports and documents released by Contemporary Amperex Technology Co. Limited, news reports, industry research reports, expert interviews and so on. Through the collection and analysis of these materials, information with regard to the development process, management strategies, and technological changes of CATL was obtained.

4. Analysis of the Evolution and Policies of the New Energy Vehicle Industry

4.1 Evolution Process of the New Energy Vehicle Industry

NEVI: In the early stage, the main type of new energy vehicles was hybrid vehicles, with relatively immature technology. Due to short driving ranges, long charging times, and safety issues related to electricity, the market acceptance was generally low. However, with the innovation of battery technology and the improvement of public environmental awareness, pure electric vehicles gradually gained widespread recognition. In recent years, the performance of new energy vehicles, such as driving range and charging speed, has continuously improved, and the market penetration rate has increased year by year.

Battery Industry: The battery industry has expanded from the consumer electronics sector to the new energy vehicle sector. Initially, batteries were mainly used in consumer electronics such as mobile phones and laptops. But with the rise of the new energy vehicle market, power batteries have been the main growth point of the battery industry. At the same time, battery technology has been continuously advancing, with the emergence of battery products with high energy density, long lifespan, and high safety.

4.2 Policy Evolution

Early Policies: In the early stage of industry development, the government mainly encouraged the purchase and use of new energy vehicles through subsidy policies, and provided significant support

for the research and development investment of battery enterprises, significantly reducing the purchase cost of new energy vehicles and promoting the expansion of market coverage, as well as driving the technological progress of battery enterprises. As the industry developed, the government gradually adjusted the policy direction, shifting from simple subsidies to encouraging technological innovation and industrial upgrading. For instance, raising the technical threshold of subsidies, guiding enterprises to increase research and development investment, and also introducing a series of industrial plans, clarifying the development goals and directions of the industry.

Recent Policies: In recent years, more and more local governments have placed greater emphasis on the benign development of the industry, strengthened supervision over battery recycling and safety, and further promoted the popularization of new energy vehicles.

4.3 Government's Role

The government has played a crucial role in the development of the new energy vehicle and battery industry. On the one hand, through policy guidance and financial support, the government has promoted technological innovation and market expansion of enterprises; on the other hand, the government strengthened supervision of the industry to ensure its safety and sustainable development. In addition, the government has also created a favorable environment for the industry's development through infrastructure construction and standard formulation.

5. Analysis of the Management Catch-up Mechanism of Contemporary Amperex Technology Co. Limited

5.1 Open Coding

By conducting open coding on the collected data, a total of 130 initial codes were extracted, such as "technological innovation", "research and development investment", "supply chain integration", "talent cultivation", etc. These initial codes reflect the management measures and strategies adopted by Contemporary Amperex Technology Co. Limited in its development process.

5.2 Main Axis Coding

Further analysis of the initial concepts obtained through open coding was conducted, and they were classified into 14 main categories, such as "technological innovation management", "supply chain management", "talent strategy management", "marketing management" and so on. These main categories cover all aspects of Contemporary Amperex Technology Co. Limited' enterprise management and reflect the core management elements in the catch-up process.

5.3 Selective Coding

Based on the main axis coding, the core category - "management catch-up mechanism" was further refined. By analyzing the relationship between the core category and the main categories, a theoretical model of Contemporary Amperex Technology Co. Limited' management catch-up mechanism was constructed

5.3.1. Technological Innovation Management Catch-up

Research and Development Investment: Since 2011, Contemporary Amperex Technology Co. Limited has attached great importance to research and development investment, setting up six major R&D centers globally and thirteen battery production and manufacturing bases. It continuously increased investment in battery technology research and development. Its R&D personnel exceeded 20,000, and the 21C Innovation Laboratory has become a research and development highland for advanced technologies in energy storage and conversion worldwide. By establishing R&D centers and collaborating with research institutions, CATL has continuously enhanced its technological innovation capabilities.

Technology cooperation and introduction: CATL actively conducts technological cooperation with advanced enterprises both domestically and internationally. It has set up subsidiaries in Paris, Yokohama, Munich and Detroit. By introducing advanced technologies and equipment, it accelerates the pace of technological catch-up. Meanwhile, it focuses on independent innovation and has a total of 43,354 domestic and foreign patents, forming core technologies with independent intellectual property rights.

Technology iteration and upgrading: Keeping up with the industry's technological development trends, CATL continuously conducts technology iteration and upgrading. By developing new-generation battery products, it improves the energy density, safety, and lifespan of batteries to meet the market's demand for high-performance batteries.

5.3.2. Supply chain management catch-up

Supplier selection and cooperation: CATL has established strict supplier selection standards and has established long-term and stable cooperative relationships with high-quality lithium battery raw material suppliers and component suppliers. Through deep cooperation with suppliers, it has achieved stable supply of raw materials and cost control.

Supply chain collaboration: Strengthening collaboration with upstream and downstream enterprises in the supply chain, CATL has signed industrial and capital cooperation framework agreements with well-known companies such as China Petrochemical Corporation, etc., achieving information sharing and resource optimization allocation.

5.3.3. Talent strategy management catch-up

Talent introduction: CATL Technology has formulated attractive talent introduction policies and conducts research on external market salary levels and industry salary trend changes every year. Based on a comprehensive grasp of external salary data, combined with its own business situation and development needs, it reviews employee salary conditions and formulates annual salary adjustment plans, attracting a large number of outstanding battery technology and management talents from both domestic and abroad.

Talent cultivation and development: CATL has established a complete talent cultivation system. For example, it conducts "Leadership Lecture Hall" sessions in a top-down manner, plans learning paths to cultivate system engineers in the R&D department, and rapidly enhances the capabilities of the sales front-line team through training and combat integration projects. It also conducts regular training programs such as FEMEA, 6-Sigma, integrated student recruitment projects, and special training programs. Through internal training, external study, and project practice, it continuously improves employees' professional skills and comprehensive qualities.

Talent incentives: CATL differentiates performance assessment indicators for different job categories and positions. Through performance management, it strengthens the value evaluation system based on responsibility results and performance, continuously enhancing the company's overall competitiveness.

5.3.4. Marketing management catch-up

Experiential strategy: CATL entered the sports marketing field and became the chief partner for Migu's European football event broadcasting. Football events have a large audience base, providing opportunities for CATL to reach a wider audience.

Market expansion: CATL actively expands domestic and overseas markets and has established partnerships with well-known automotive manufacturers. Through participation in international exhibitions and conducting overseas marketing activities, it has enhanced its company's visibility and influence in the international market.

6. Analysis

6.1 The relationship between government policies and enterprise catch-up

Government policies have played a key guiding and supporting role in CATL catch-up process. Subsidy policies have reduced the company's R&D costs and market promotion difficulties, tax

incentives have alleviated the company's burden and market access difficulties, and industrial planning has pointed out the direction for the company's development. Moreover, government regulatory policies have also prompted the company to strengthen technological innovation and management improvement, ensuring the safety, healthy competition, and steady progression of the industry.

6.2 The effectiveness of the enterprise catch-up mechanism

CATL has achieved a leap from being a latecomer in the industry to a leader through multiple catch-up strategies such as technological innovation management, supply chain optimization management, talent strategy management, and marketing management. Technological innovation management enhances the core competitiveness of enterprises, supply chain management ensures the stable supply of raw materials and cost control, talent strategy management provides human resource support for the development of enterprises, and marketing management expands market share.

6.3 Insights for other latecomers

The successful experience of CATL provides valuable insights for other latecomers. Firstly, latecomers should closely monitor policy dynamics and fully utilize policy support; in addition, strengthening technological innovation and improving one's own core competitiveness is also an indispensable and important aspect. Besides, optimizing supply chain management and reducing operational costs are necessary. Additionally, emphasizing talent cultivation and recruitment, and building a high-quality talent team are also important. Last but not least, formulating reasonable marketing strategies is also key part that cannot be ignored.

7. Conclusion

This research takes Contemporary Amperex Technology Co. Limited as the case study object and uses the three-step coding method of grounded theory to explore its successful experience in the background of the evolution of the new energy vehicle industry and the lithium battery industry, achieving the leap from being an industry latecomer to a leader with the support of policy and its own management catch-up strategies. The research found that government policies played a significant guiding and supporting role in industrial development. Contemporary Amperex Technology Co. Limited has achieved rapid development through multiple catch-up strategies such as technological innovation management, supply chain management, talent strategy management, and marketing management.

8. Research Limitations and Prospects

This research is based on the case of Contemporary Amperex Technology Co. Limited for analysis. Although it has certain representativeness, it may have certain limitations. Future research need to expand the sample range, promptly supplement primary data, and conduct in-depth studies on more lithium battery enterprises. At the same time, it can further explore the differences and commonalities of enterprise catch-up mechanisms in different industrial environments and policy backgrounds, providing guidance for the catch-up practice of enterprises.

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