International Relations and Diplomacy, May-June 2025, Vol. 13, No. 3, 119-133
doi: 10.17265/2328-2134/2025.03.001

Growth and Competitiveness of Chinese Electric Vehicle and Electric Vehicle Battery Companies: Observation and Analysis from an Ecosystem Perspective

CHEN Jin
Ritsumeikan University, Ibaraki, Osaka, Japan

This study observes the process of strategy building and capability accumulation of companies in the currently booming Chinese electric vehicles (EV)[1] market from the perspective of business ecosystems. While examining the internal and external factors of the formation about the Chinese EV industry business ecosystem, such as industrial structure transformation, technology transfer, government policies, and corporate competition, with the platform theory, I analyze the growth strategies and competitiveness of Chinese companies, particularly BYD Co., Ltd. (BYD), which has risen to the top of the world in EV completed vehicles, and Contemporary Amperex Technology Co., Ltd. (CATL), which has risen to the top of the world in electric vehicle batteries (EVB)[2]. BYD and CATL have gained competitive advantages by utilizing the distinctive management resources, which have accumulated over the years to build platforms for EVBs and EVs in response to changes in the external environment, and have actively developed their platform strategies.

Keywords: electric vehicle (EV), electric vehicle battery (EVB), BYD, CATL, competitive advantage, platform strategy

Problem Statement and Analytical Perspective

In recent years, China's new energy vehicle (NEV) industry, mainly on EVs, has been growing rapidly. In 2024, NEV sales in China increased to more than 12 million units, 35.5% more compared to 2023, exceeding 40% of new vehicle sales[3]. At the same time, NEV sales in China accounted for 65% of global NEV sales.

Symbolizing China's rise, BYD's annual sales exceeded 4.2 million units in 2024, leading the world in NEV sales for the third consecutive year. Based on the ranking of global new vehicle sales, BYD rose from behind the top 20 in 2021 to the top 16 in 2022, the top 10 in 2023, and to the top 6 surpassing America's Ford, Japan's Honda and Nissan in 2024. Meanwhile, the world's electric vehicle batteries (EVB) capacity increases by 26.8% to 894.4 gigawatt-hours. CATL was giving the world's market share of 37.9%, making the eighth consecutive year of dominance[4]. In 2024, the combined share of the world's EVB, consisting of No. 1 by CATL (37.9%) and

CHEN Jin, Ph.D., Project Researcher, OIC General Research Institution of Ritsumeikan University, Ibaraki, Osaka, Japan.
[1] China Electric Vehicles (EVs) are essentially a general term for battery electric vehicles (BEVs) that get their power from in-vehicle batteries and plug-in hybrid vehicles (PHVs). Fuel cell vehicles (FCVs) are also included, but their share is small.
[2] Regarding BYD, the author conducted an on-site survey at the company's Shenzhen headquarters factory in September 2010.
[3] Based on an article in the JETRO dated January 16, 2025. https://www.jetro.go.jp/biznews/2025/01/1e84c10fc2fa9d45.html.
[4] Based on statistical data from South Korean research company SNE Research. https://news.yahoo.co.jp/articles/085522785fcca3238e3c57783a4ec3c3f8c2ba96/images/001.

No. 2 by BYD (17.2%), exceeded 55%. Meanwhile, global automakers are increasing their technical collaboration with BYD and CATL using their EV technology and EVB, BYD, and CATL are also expanding their exports of EVs and EVB and local production overseas.

Based on the above recognition, this study aims to clarify, from the perspective of a business ecosystem, the following issues: how BYD and CATL gained a competitive advantage while building platforms for EVs and EVB, and how they have developed their platform strategies.

The world's industrial structure is undergoing a major transformation as information networks become more widespread. In the 21st century, this transformation has expanded rapidly to non-digital industries such as manufacturing, and the global industrial structure is evolving into a business ecosystem. A business ecosystem is an analogy of industrial structure based on an ecosystem and represents the overall collaborative relationships between companies in developing fields that are forming industrial systems. It is an evolution of the ecosystem concept, which is leading to the realization of value creation through ecosystems (Sugiyama, Nagauchi, Kameoka, & Funatsu, 2023. pp. 120-140). Like ecosystems in the natural world, business ecosystems are a mixture of companies with different roles. Using a biological analogy, Iansiti and Levien (2004) argued that their special companies that leads industrial evolution, they called these companies keystone companies and their corporate strategies keystone strategies. In the field of competitive strategy theory, a strategy like this is called a platform strategy.

A platform is a foundation that connects different elements and groups to build a network. A platform business is a business that provides infrastructure and rules that promote the interaction of multiple different user groups by providing products (Maruyama, 2011. p. 236). The strategic actions of platform companies that affect the response behavior of coexisting companies and user companies are called strategic levers (Gawer & Cusumano, 2002).

Previous research has revealed that there are surprising similarities in the evolution of industries through ecosystems. The elements that make up these similarities are platform companies, open and closed areas, and the international division of labor between developed and emerging industries. Platform strategies consist of a game of ecosystem establishment and a game of ecosystem expansion. The turn that connects the two games is called an inflection point, whose turn it is at the inflection point has very important impact on the success of the platform strategy in the process of platform companies gaining a competitive advantage in global ecosystems: (1) they differentiate the system architecture into open and closed areas according to their own business model based on international open standardization and encourage emerging industry to enter the open area; (2) They gain competitiveness by positioning themselves as a hub that mediates multiple markets, while at the same time "promoting open standards" and "expanding to emerging countries"; (3) They strengthen their bargaining power by "entering peripheral markets" and at the same time, they expand into peripheral markets. They will expand the ecosystem by stimulating and revitalizing the network and maintaining openness in the division of labor network through "reference designs" and "simple approach inter-company relationships" (Tachimoto, 2017. pp. 291-298, 331-339).

However, most of the research on platform strategies of manufacturing companies has been conducted so far mainly on companies in developed countries. There are analyses that suggest that the expansion of the open market (industry scale) as the ecosystem expands provides growth opportunities for companies in emerging countries, but the research on the emerging countries platform companies grasping technologies in closed areas is insufficient (Chen, 2023). This paper aims to contribute to theoretical research on the evolution of ecosystems

in the manufacturing industry through a strategic analysis of EV-related companies in emerging country (China) that have grown into such platform companies.

If I summarize the above theory in an analytical framework diagram (Figure 1) in accordance with the actual situation in China, the platform strategy consists of the ecosystem establishment period, the transition period from ecosystem establishment to expansion, and the ecosystem expansion period. During the ecosystem establishment stage, platform companies will differentiate their system architecture into open and closed areas according to their own business models based on international open standardization and encourage domestic and foreign companies to enter the open area. During the transition from ecosystem establishment to ecosystem expansion stage, platform companies will win the turn at the inflection point that connects the two games and will be able to secure intellectual property rights. In the ecosystem expansion stage, platform companies will provide one-stop solutions to customer problems, strengthen their bargaining power by entering adjacent markets, stimulate and invigorate those markets, and expand the ecosystem.

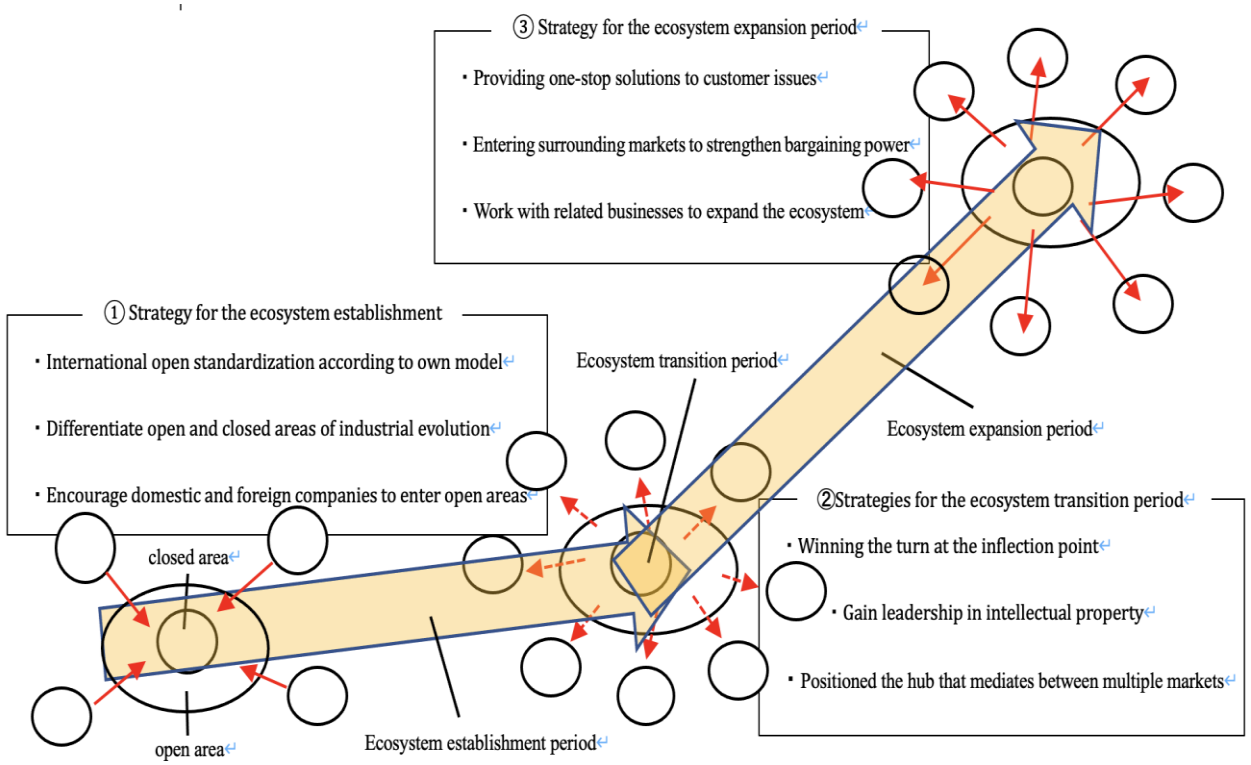

Figure 1. Analytical framework: Competitive strategies of platform companies.
Sources: Created by the author.

Next, regarding the formation of the Chinese electric vehicle industry ecosystem and the strategic development of its platform companies, following the analytical framework in Figure 1, in Section 2, I will observe the background factors of the formation of the Chinese electric vehicle industry ecosystem, and in Section 3, I will observe the advantage acquisition and strategic development of BYD and CATL. Specifically, the first is the accumulation of battery technology and entry into EV industry at the stage of the ecosystem establishment, and the second is the winning of the turn and competition at the inflection point of the transition from the establishment of the ecosystem to its expansion, thirdly I will observe and analyze the strengthening of competitiveness and the development of platform strategies during the ecosystem expansion stage.

Background Factors of the Formation of China's Electric Vehicle Industry Ecosystem

Since the early 1990s, the combination of globalization and information technology has brought about major changes in product and process architecture (Fujimoto, 2002). In the production of electronic products, horizontal division of labor has come about through modularization. In addition, the cost ratio of electronic components and software to product development costs has increased significantly. The emergence of new technological paradigm has given early movers and latecomers alike opportunities, providing latecomers with a window of opportunity to catch up. How companies respond to these changes will determine whether they can take leadership in their industry (Lee & Malerba, 2016). Unlike gasoline vehicles that are centered on engines, EVs are the power system powered by batteries (EVB), motors, and converters, and this power system accounts for about half of the cost of a completed EV. Among them, the EVB is the most core component that determines the EV's driving range, service life, and driving safety, and its cost accounts for about 40% of the cost of a completed EV.[5]

Since 1990s, which brought about major change in product and process architecture, China's economy has progressed in the direction of liberalization and market opening, and the companies from developed countries such as Japan, the United States, and Europe have been actively expanding their activities to enter China in response to this situation. As the economy further develops due to the activities of foreign companies that have expanded into China, new business opportunities have been created for Chinese electronics components, especially emerging private companies, and this has contributed to their creation and development (Fujimoto & Shintaku, 2005; Chen, 2007; 2017; 2018). In particular, the southern China region centered Shenzhen, where BYD and ATL (the predecessor of CATL) are located, has formed supporting industries for parts through the introduction of technology. The entry of many multinational companies from developed countries has promoted the foundation and horizontal division of labor, and the country has become the accumulation area of the world's largest consumer electronics industry as the center of the electronics industry (Ding, 2013).

On the other hand, the accumulation of competitiveness in Chinese passenger car companies was strongly restricted by the central government's strict entry restrictions and anti-competitive policies, in addition to the complex and difficult-to-master product architecture (Chen, 2000; 2007). However, the domestic production policy for passenger car parts, which was promoted from the late1980s by Zhu Rongji, who was the mayor of Shanghai at the time (later became Prime Minister), actively introduced automobile parts production technology from developed countries (Li, 1993). This laid the industrial foundation for new private automobile companies, such as Geely, Chery, and BYD, which entered the market from the late 1990s to the early 2000s. After the global financial crisis in 2008, latecomer Chinese private automobile companies took advantage of government subsidy systems to increase production of low-end compact cars and improve their competitiveness (Chen, 2012). In line with this trend, small and medium-sized Japanese automobile parts manufacturers also began to actively enter the Chinese market and supply to Chinese private companies (Chen & Jin, 2013). In the late 2010s, Tesla which entered the local EV production in Shanghai, has been utilizing and strengthening this industrial base (Tang, 2018).

In the 1990s, China's crude oil imports increased significantly (in the mid-2000s, imports exceeded domestic production) as the market opening and the economy grew. As a result, "eliminating dependence on oil" became

[5] The cost ratios for EV power systems and EVB are inferred from multiple sources. Related technologies are evolving rapidly, and there are currently no set standards.

an energy security issue for China. Against this backdrop, the Chinese government began to formulate an industrial policy to develop electric vehicle. In 1999, Wan Gang[6], who had been working at Audi in Germany for nearly 10 years, was invited by Lu Fuyuan, who was then Vice Minister of Education of China (and previously served as Vice President of FAW, Vice Minister of Machinery Industry of China, and Minister of Commerce of China), to visit Chinese automobile industry with a delegation of doctoral engineers from the German automobile industry. At that time, Wan proposed to the Chinese side that NEVs should be developed. Afterwards, Mr. Wan returned to China at the end of 2000 upon invitation from Tongji University and the Ministry of Science and Technology of China and was appointed by the Ministry of Science and Technology of China as the chief expert and general manager of the "Major Specialized Project on EVs" from 2001 to 2005. The research results of this "project" were approved by the Chinese government in 2006[7] and in 2007 Wan was promoted from president of Tongji University to China's Minister of Science and Technology. Meanwhile, around the same time, from the early 2000s, the Chinese government began providing large amounts of subsides for the technological development of NEVs, mobilizing automakers, parts manufacturers, and research departments to establish research and development systems for key technologies such as fuel cell vehicles (FCVs), plug-in-hybrid vehicles (PHVs), battery-powered vehicles (BEVs). NEV power systems, motors, and EVB, and began developing model cars.

In 2009, the government announced the "Ten Cities, Thousand NEVs Project"[8] and the "Notice on Trial NEV Purchase Subsides for Individuals"[9] and began to adopt a policy of promoting the spread of new energy and energy-saving vehicles through the provision of purchase subsidies. In the 2011-2015 Five-Year Plan published by the government in early 2011, NEVs were positioned as one of the strategic emerging industries to be prioritized. In the same year, the "Foreign Investment Industry Guidance Catalog" was published, which set out guidance lists for foreign investment industries. The "Power Battery Company Whitelists"[10] (2015) clearly stipulated restrictions on foreign investment in automobile batteries. CATL, BYD, and other local Chinese companies were included in the "Power Battery Company Whitelists" (2015), but Panasonic, LG, and Samsung, which had already expanded into local production in China, were excluded. A special license plate system for EVs was introduced in 2017, further supporting the introduction of EVs. In 2018, the Chinese government

[6] According to the free "encyclopedia" (Wikipedia)", Wan Gang studied abroad at Clausthal University of Technology in Germany as a doctoral research student from 1985 to 1991. After graduating from Clausthal University of Technology in 1991, he joined Audi in the same year and was promoted to technical accounting in the production department and overall planning department. In 2001, he served as director of the new Energy Vehicle Engineering Center at Tongji University. In 2004, he was promoted to president of Tongji University. On April 27, 2007, he was appointed Minister of Science and Technology. On March 13, 2008, he was appointed Vice Chairman of the National Committee of the Chinese People's Political Consultative Conference. On June 2, 2016, he was appointed Chairman of the China Association for Science and Technology.

[7] See the February 20, 2006, website of the Ministry of Science and Technology of China. https://www.most.gov.cn/kjbgz/200602/t20060219_28821.html.

[8] The "Ten Cities, Thousand NEVs Project" is a four-year initiative from 2009 to 2012 to introduce new energy and energy-efficient vehicles such as hybrid vehicles, electric cars, and fuel cell vehicles in 13 (final 25) cities in China, with more than 1,000 vehicles per city (final 23,000 vehicles). The Chinese government will select target cities, and the local governments will provide subsidies for the purchase of new energy and energy-efficient cars and the construction of infrastructure.

[9] As a result of this notification, subsidies have been offered to individuals who purchase NEVs in the five cities of Shanghai, Changchun, Shenzhen, Hangzhou, and Hefei since June 1, 2009. The subsidy standard is based on the capacity of the secondary drive battery installed, with 3,000 RMB per kWh (later changed to the driving range in 2017, and the subsidy amount was significantly increased), with a maximum of 50,000 RMB for PHVs and 60,000 RMB for EVs.

[10] In order to protect the domestic battery industry and prevent proliferation of battery companies, the Ministry of Industry and Information Technology announced a list of companies that meet the "Power Battery Industry Standard Conditions" issued in March 2015 (commonly known as the "Power Battery Company Whitelist"). However, only China effectively restricted the entry of foreign companies. The regulation was abolished in June 2019.

allowed Tesla owning 100% investment to produce locally in China, accelerating the shift to EVs in the automotive industry. After that, the Chinese government's EV subsidy policy gradually reduced the amount and is scheduled to be completely abolished in 2022. Meanwhile, starting in 2020, China and the EU have announced bills to ban the sale of gasoline and other fuel-powered vehicles in 2030s, and the United States and Japan are following suit.

Above, I have reviewed the background factors behind the formation of Chine's EV industry ecosystem. The formation (establishment stage) of China's EV industry ecosystem began in the 2000s, and in the 2010s, the government's EV sales promotion policy, especially the large-scale and wide-ranging subsidy policy for EVs equipped with domestically produced EVB implemented in the mid-2010s, is recognized as having caused the ecosystem to enter the expansion stage. In other words, the Chinese government's EV sales promotion policy is seen as an "inflection point" that connects the establishment of the ecosystem with its expansion, which company's turn is to reach this inflection point will have a very significant impact on the success of the platform strategy.

BYD and CATL's Advantage Gain and Strategy Development

Accumulation of Battery Technology and Entry Into the EV Industry

Both BYD and ATL (the predecessor of CATL) grew as suppliers of mobile phone batteries in the Shenzhen area and entered the EV industry with battery technology as their own closed area of expertise.

Wang Chuanfu, who founded BYD, graduated from the Department of Metallurgy and Physical Chemistry at the Central South Mining and Metallurgy College (now Central South University) in Hunan Province. In 1987, he entered the Beijng Institute of Nonferrus Metals, Chinese Academy of Sciences, where he obtained a master's degree in batteries after three years. He later worked at the Chinese Academy of Science, where he conducted research on alkaline nickel-cadmium batteries and nickel-metal hydride batteries (Zheng, 2009, p. 20). In 1995, Mr. Wang retired from the Chinese Academy of Sciences, and founded BYD Battery Co., Ltd. (BYD Battery), a battery manufacturer in Shenzhen. BYD Battery researched how to improve its quality of domestically produced cobalt and invented a method to improve its quality. This method enabled the company to reduce costs by 40% compared to foreign battery products. After that, it started to supply nickel-cadmium batteries to DBTEL, a Taiwanese wireless phone manufacturer, instead of SANYO Electric. In 1997, while selling nickel-metal hydride batteries, it also started research on lithium-ion batteries. In 2000, it started to produce lithium-ion batteries and received an order from Motorola. In 2002, it was able to secure orders from approximately 30%-40% of Motorola's mobile phone battery storage units. Nokia and Ericsson also began purchasing storage batteries from BYD Battery. In 2002, BYD Battery had grown into the largest secondary battery manufacturer in China. At the same time, BYD's production of nickel-cadmium batteries was the second largest in the world, its production of nickel-metal hydride batteries was the third largest, and its production of lithium-ion batteries was the fourth largest.

Since 2002, BYD has expanded beyond simply manufacturing batteries and began to enter the manufacturing of mobile phone terminal parts and the assembly of mobile phone terminals. As the mobile phone terminal parts business grew, BYD Electronics Co., Ltd. (BYD Electronics) was established. BYD Electronics can produce most of the parts for mobile phones, such as LCDs (Liquid Crystal Displays) and mold processing, and provides a series of services from design to parts production, assembly, and quality inspection to major companies such as Nokia and Motorola. Nokia and Motorola also dispatched engineers and quality managers to

BYD Electronics to provide technical and quality control training. After that, BYD Electronics then scouted human resources from Foxconn (Taiwan's Hon Hai), the world's largest EMS company, and learned Foxconn's efficient production management system. It has established a "low-cost production system" in which they manufacture parts, production equipment, and even the molds required for both productions in-house, and produce everything except important tools and jigs related to added value on a line mainly using human labor (Li, 2010b). BYD, which is seeking to diversify its business, has focused on automobiles after mobile phone terminal parts. The reason for choosing automobiles is that it wanted to match their strength in battery manufacturing with automobiles and to produce electric vehicles in the future. On January 23, 2003, BYD acquired the state-owned Xi'an Qinchuan Automobile, and in March of the same year, they established BYD Automobile Co., Ltd. (BYD Automobile). At the same time, it focused on research and development of lithium-ion iron phosphate batteries and BEVs and PHVs. It announced prototypes of BEVs and PHVs in 2004, released the world's first PHV in 2008, and a mass-produced BEV model in 2011. Meanwhile, BYD formed a technical partnership with Germany's Daimler in 2010 and began to improve the technical level of its EVB and the compatibility of EVs.

Meanwhile, Robin Zeng Yuqun, the founder of CATL, graduated from the School of Marine Engineering at Shanghai Jiao Tong University in 1989. He started working at state-owned enterprise in Fuzhou, Fujian Province, but quit after three months. He was then re-employed at a factory in China for a Hong Kong-based company that produced magnetic heads for personal computers (SAE Magnetics, which was acquired by the Japanese company TDK in 1986) in Dongguan, next to Shenzhen. He rose to the position of general manager of the factory in 10 years. In 1999, in response to the rapid growth of the electronics market, Mr. Zeng founded Amperex Technology Limited (ATL) in Hong Kong together with some Chinese managers from SAE (He, 2022), a company that produced batteries for electronic products such as mobile phones and MP3 players. Initially, ATL purchased a lithium battery patent from Bell Labs with US $1 million, which accounted for 40% of the company's total capital. After repeated experiments, ATL solved the problem of lithium battery expansion and deformation and succeeded in commercializing the product before more than 20 other companies around the world that had also purchased the patent. In 2000, ATL built a factory in Dongguan and began mass production. In 2001, it sold 1 million batteries, mainly to local Chinese companies. In 2003, ATL developed a battery exclusively for Apple's iPod, and won orders for 18 million iPod batteries. Since 2004, ATL has supplied mobile phone batteries to companies such as Apple, Samsung, and Huawei. In 2005, ATL ran into financial difficulties due to its expansion and was acquired by TDK for US $100 million, but ATL's previous management including Mr. Zeng, was retained.

During this time, while still employed, Mr. Zeng continued to study electronics, information technology, and the battery technology at graduate school. From 1997 to 2001, he studied at the Technology Graduate School of South Chine University, earning a master's degree in battery and information engineering, and from 2002 to 2006, he studied at the Institute of Physics, Chinese Academy of Sciences, earning a doctorate in condensed physics. Considering the future potential of automotive batteries, ATL's management announced a "second start-up" policy in 2007, focusing on developing the power battery area. In March 2008, Mr. Zeng built ATL's third factory in China in his hometown of Ningde, Fujian Province, and transferred some of the production capacity of Dongguan factory in Guangdong Province to the Ningde factory in Fujian Province, to prepare for the production of automotive batteries. ATL also established a power battery research department within the company and began R&D on automotive batteries. In 2011, considering the Chinese government's policy of

restricting foreign investment in automotive batteries, ATL spun off its internal power battery research department and established a new company, Contemporary Amperex Technology Co., Ltd. Mr. Zeng is the chairman of this new company. The English name of Contemporary Amperex Technology Co., Ltd. is the same as the previous company ATL, with the letter "C" added to the beginning of the name. This resulted in the company being abbreviated to "Contemporary" and the English name CATL. However, due to the Chinese government's restrictions on foreign investment, the Japanese ATL only holds 15% of CATL's shares, with the remaining 85% held by Chinese management, including Mr. Zeng. Only one year after its establishment, CATL received support from the Fujian Provincial Government and received an order worth 890 million yuan from a bus manufacturer in Xiamen, Fujian Province. In 2011, CATL also formed a strategic partnership with BMW of Germany, and while improving the technical level of its own in-vehicle batteries, it began supplying batteries to domestic and foreign automakers.

Seizing the Opportunity at the Inflection Point and Establishing a Competitive Advantage

Entering the 2010s, BYD and CATL quickly cooperated with the world's top automobile companies to seize the opportunity at the inflection point of the government's electric vehicle promotion policy and began to strive to gain leadership in intellectual property (product IF standards).

In 2009, BYD developed the electric car e6, taking advantage of government subsidies and NEV promotion policies. In 2010, 100 e6s were purchased by the Shenzhen Municipal Government as taxi vehicles, and sales began in Beijing and other cities. Also in 2009, BYD acquired a bus manufacturing company in Hunan Province, acquiring the capacity to manufacture electric buses. Since 2011, BYD-manufactured electric buses were released in many cities in China and have since expanded to more than 100 cities around the world, including Brazil, Japan, the UK, Italy, France, and the US.

The government policy that has been in place since 2011 to restrict foreign investment in automotive batteries has been a major boost for BYD and CATL, who entered the automotive battery production industry early on. Since 2015, the government has issued the "Power Battery Company Whitelist" four times, CATL was on the first list, BYD on the second. Subsidies will only be paid to EVs equipped with EVB by companies on this list, so the two companies seized the opportunity and accelerated their growth. By 2016, BYD had established itself as the industry leader in automotive battery production in China.

To be on the whitelist of power battery company that excludes foreign-affiliated companies, CATL made the Japanese company to withdraw its capital completely from ATL in 2015, then it has become a 100% locally owned Chinese company. Compared to BYD, which produces lithium iron phosphate batteries (LFP batteries), CATL mainly produces ternary lithium nickel manganese cobalt oxides batteries (NMC batteries). NMC batteries are less safe than LFP batteries but have a relatively high battery energy density. Since 2016, the government has been giving incentives and preferential treatment to NMC batteries, which have a high energy density, and CATL, which bet on NMC batteries, has risen to prominence (Wang, 2020).[11] In 2016, CATL's sales increased by 161% and profits by 206% compared to the previous year, and in 2017, its automotive battery production volume surpassed Panasonic and BYD to become the world's largest.

[11] According to Wang (2020), the Notice on Adjusting Financial Subsidy Policies for Promoting New Energy Vehicles, jointly issued by four departments of the Chinese government in 2016, was the first to put forward specific requirements for the energy density of new energy vehicles. It stated that electric passenger vehicles with battery energy density below 90 Wh/kg would not be eligible for compensation, and that vehicles with battery energy density of 120 Wh/kg or more would be given subsidies at 1.1 times the normal rate.

Among them, CATL's cooperative relationship with BMW played an important role in acquiring intellectual property leadership. In 2011, BMW planned to experimentally launch several hundred EVs in the Chinese market and approached CATL about supplying in-vehicle batteries for these vehicles. CATL, which had just been transformed from ATL's power battery research department, made every effort to meet BMW's request. CATL built the largest test center in Asia at the time, and together with BMW, formed an R&D group of more than 100 people to translate and clear more than 800 pages of German technical standards provided by BMW. As a result, in 2012, CATKL won an order for EVBs from BMW. Through this, CATL absorbed BMW's technology, deepened its understanding on EVBs and EVs, and raised its product level to international standards. It was also a great honor for CATL to meet BMW's standards and supply EVBs to BMW. Since 2013, CATL has received orders from many companies, including Beijing Automotive Industry Corporation, Guangzhou Automobile Group, Chang'an Automobile Group, and Geely Automobile Group, becoming an important supplier of automobile batteries in China. Furthermore, in 2016, the Chinese government's policy of encouraging high-energy density batteries has been a tailwind for CATL, and the company has positioned itself as a hub that mediates multiple markets, expanding its supply base to local companies while also securing supply bases for many multinational companies, including VW, Tesla, Toyota, Hyundai Motor, BMW, and Daimler.

On the other hand, as a latecomer to automobile industry, BYD must learn from scratch not only how to manufacture EVBs, but also how to manufacture automobiles, which are integrated products. BYD imitated other companies' products to shorten the development time for new cars and reduce development costs. The purpose of imitating other companies' products is not only to reduce costs, but also to analyze car manufacturing using reverse engineering techniques. When disassembling other companies' products, experts from the intellectual property law department were called in to investigate which parts of the car had already been patented and which parts had not yet been patented. Then, BYD copied the parts for which patents had not been applied for and made minor adjustments to the parts for which patents had been applied for, so that it did not have to pay patent fees.[12]

In addition, within BYD, the words "vertical integration" and "large complete" are often used in relation to parts procurement. "Vertical integration" means to do everything in-house, from procuring raw materials to manufacturing finished product. "Large complete" means "large-scale and comprehensive", meaning that most parts are manufactured in-house. This stems from the company's belief that in-house production of parts leads to cost reduction and improvement of parts development capabilities. For example, to improve its mold manufacturing technology, BYD is inviting mold experts from Europe to conduct joint research. In order to acquire higher mold technical capabilities, in April 2010, BYD acquired the Tatebayashi factory of Ogihara, mold manufacturer based in Gunma Prefecture of Japan. Engineers from the Tatebayashi factory are dispatched to mold factories in Shenzhen and Beijing to provide technical guidance. According to BYD's internal documents, BYD's mold research and development costs are only 27% of the average for German manufacturers and 41% of the average for Japanese manufacturers. BYD's molds are not only provided in-house, but also to other automotive manufacturers, including Nissan, Beijing Jeep, Tianjin Toyota, Naijing Fiat[13]. Even for parts that required high technology, such as engines, the company adopted a policy of initially procuring them from outside and gradually shifting to in-house production.

[12] This was based on interviews with our company during on-site investigations.

[13] "BYD strengthens technical cooperation with major European companies with a focus on EVs, expands domestic bases and product launches". *FOURIN China Automotive Research Monthly*, No. 171, 2010, p. 19.

In March 2010, BYD signed an agreement with Daimler to collaborate on the development of electric vehicles in China. BYD will be primarily responsible for battery development, while Daimler will oversee developing the vehicle body structure. The jointly developed EV, the Denze, has been on the market since 2014. Through its collaboration with Daimler, BYD aimed to learn about the overall structure of EVs. By deepening its understanding of not only battery technology but also vehicle manufacturing technology, and by successfully matching the two, it has become possible to develop high-performance EVs. BYD's self-developed 110 kW and 150 kW motors have already become the standard drive components for its own EVs, the Qin and the Tang. It also developed major EV parts such as inverters, converters, and transmissions in-house, and took advantage of the "low-cost production system", it was established early on to simultaneously pursue cost reduction and consistency and quality improvement for completed EVs (Song, 2015). Meanwhile, about EVBs, CATL took the top spot in domestic on-board volume in 2017 due to the government's policy to encourage high-energy density batteries, but BYD has been increasing its production of NMC batteries while taking advantage of the safety and low cost of its own LFP batteries to supply them to its own EVs. In addition, BYD announced in March 2020 that the blade battery is like a beam that directly supports the battery pack, and the volume utilization rate (energy density) of the product has improved by more than 50%. More than 90% of the products are for in-house use, and the rest are supplied to FAW, Chang'an Ford, Ji Kang Automobile, etc. In this way, BYD has striven to take the lead in IF standards for EVs, positioned itself as a hub for battery technology, and established a competitive advantage.

Strengthening Competitiveness and Implementing Platform Strategies

In the 2020s, following the abolition of government subsidy policies, BYD and CATL strengthened the competitiveness of their EVBs while also developing chassis specifically for EVs, implementing platform strategies, and strengthening their bargaining power by entering peripheral markets.

Since 2021, the whitelist for power batteries has expired, and there have been frequent fires caused by next generation NMC batteries, such as NCM 811. Automakers such as Guangzhou Automobile, Xpeng, and NIO, which adopted NCM 811 in large quantities in pursuit of a long driving range, have suffered, and have prioritized safety performance. This has made LFP batteries popular again among automakers, and BYD's long-accumulated LFP battery development and manufacturing technology has been reevaluated. Meanwhile, BYD has reconsidered the structure of the battery module more rationally and released the so-called "blade battery". The blade battery is a type of LFP, in which the battery cell itself is thin and elongated like a sword, and the cell itself is directly incorporated into the battery pack as a structural component. This makes it possible to fit more battery cells than conventional EVBs, increasing the energy density and significantly increasing the driving range while being lighter and smaller in volume. In addition, LFP batteries do not use rare metals such as cobalt or nickel and are cheaper than conventional lithium-ion batteries. In China, where EVs continue to expand, the amount of LFP installed is rapidly increasing. The background to this is the intensification of competition due to the abolition of the government subsidies. CATL's share of LFP batteries, which account for 70% of China's EVB installations, is clearly declining. Regarding LFP battery sales from January to September 2023 in terms of installed capacity, CATL's share was 34%, down 11 (percentage) points from the same period last year, ceding the top spot to BYD.[14] BYD's blade batteries are not only supplied to domestic manufacturers, but also to international giants of the automobile industry such as Tesla and Toyota since 2022.

[14] According to an article in the *Nihon Keizai Shimbun* dated October 21, 2023.

Another "weapon" of BYD, along with the blade battery, is its own development platform exclusively for EVs, called the "e-platform". In 2018, the company launched its first EV-exclusive BYD and unveiled the chassis "Platform 1.0", and in 2019 announced the establishment of a joint venture for EV research and development with Toyota. At a briefing held in April 2021 on the "e-Platform 3.0" jointly developed with Toyota, the company touted its high performance, saying,

> It holds the key to realizing the electrification and intelligence of EVs. It has a maximum efficiency of 270kW, can accelerate from 0 to 100km/h in as little as 2.9 seconds, is compatible with high-voltage charging of up to 800V, and can travel up to 150km on a five-minutes charge. (Tanaka, 2022)

BYD has already received negotiations from automakers such as Beijing Automotive Group, Changan Automobile, Dongfeng Motor, Toyota, and Daimler, the company is also proactively offering "e-Platform 3.0" to other manufacturers and is taking a strategy of expanding its partnerships. The battery and e-platform, which are the main components that determine the structure of an EV, are its own standards. This is a strategy to take the lead in the future EV world by spreading the EV business globally. Furthermore, in 2020, as shown in Figure 2, BYD has accelerated the overseas sales of core parts related to EVs by making its own business divisions into subsidiaries and establishing five companies in the FinDreams (FD) series. The five companies are FD Battery, FD Power, FD Technology, FD Visual, and FD Mold Co., Ltd., that are self-financing companies that cover almost all-important parts of EVs, such as batteries, automotive bulbs, car electronics, powertrains, chassis, welding and production line of components, and dies.[15] BYD has announced that "As for the establishment of the FinDreams brand, we will not only continue to promote the opening and sharing of platforms, but also encourage opening and sharing of other parts, further accelerating the spread of EVs."[16]

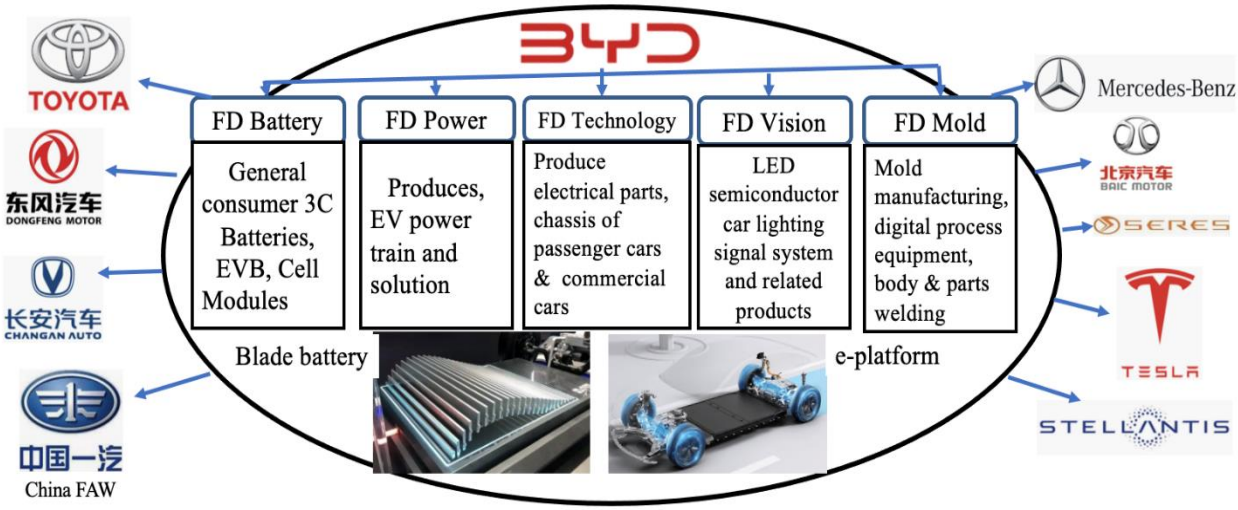

Figure 2. BYD's FinDreams series of five EV parts released to the public.
Source: Compiled by the author based on BYD materials.

BYD is also focusing on capturing overseas demand for its next stage of growth and is accelerating the expansion of exports and the establishment of overseas factories.[17] In addition to Thailand and Brazil, the

[15] Later, "FD Technology" and "FD Visual" were merged to form "FinDreams Precision Industry".
[16] According to an article in China's *Science and Technology Daily* dated March 18, 2020.
[17] Based on an article in the *Nihon Keizai Shimbun* dated November 1, 2023.

company plans to build factories in more than five locations, including Europa (Hungary). Whether it can establish a price-competitive production system around the world will determine its next stage of growth. Currently, the company exports to more than 50 countries and regions, and overseas sales in 2024 were 420,00 units. With sales outside China approaching 10% in 2024, the company has announced its intention to build a local production system.[18]

Meanwhile, CATL is rushing to make a comeback with a new LFP battery. It is generally said that if the cost of in-vehicle battery cells can be reduced below $100/kWh, EVs will be as cost-competitive as gasoline-powered vehicles. As of 2023, the price of LFP batteries (M3P) supplied by CATL to Tesla's Shanghai factory is said to have fallen from over $100/kWh in September 2022 to $70/kWh.[19] In addition, CATL announced an LFP battery in August 2023 that enables 400 km of driving with 10 minutes of charging. This new battery will be supplied to Chinese manufacturers such as Chery Automobile, Chang'an Automobile, and Geely's brand "ZEEKR", as well as to Stellantis, a major European and American automobile manufacturer. The new LFP is said to be 20% to 30 % cheaper than the currently mainstream liquid lithium-ion batteries. Batteries that use expensive rare metals are still a field in which Japanese and Korean companies are strong. LFP, along with solid-state batteries, is one of the hot topics in the fierce competition between Japan, China, and South Korea over the development of next-generation EV batteries.[20] Furthermore, CATL unveiled the "Kirin Battery" in July 2022, which is a rare metal-free sodium-ion battery and utilizes third-generation CTP (Cell to Pack) technology to achieve a driving range of 1,000 kilometers and will begin mass production in 2023. The Kirin Battery is a battery pack equipped with multiple rectangular battery cells. CTP technology allows the volume utilization rate of the battery pack to reach 72%, allowing for efficient use of vehicle space. CATL is working on LFP, NMC, and sodium batteries, which are cheaper than LFP batteries, to secure its future superiority through comprehensive battery development.

Moreover, since 2022, CATL will develop a skateboard chassis and partner with automakers. A skateboard chassis is a platform that is expected to improve space efficiency by efficiently arranging EV components. With CATL's skateboard chassis, CATL Integrated Intelligent Chassis (CIIC), and mounts batteries, it is said that the driving range can be extended to more than 800 km. The skateboard chassis is adjustable in length, can accommodate batteries in various places, and is also equipped with an electric motor and drive-by-wire system, allowing EV manufacturers to design their own vehicle body on it. On October 31, 2022, CATL and Vietnamese EV manufacturer VinFast announced that they had signed a memorandum of understanding on global strategic cooperation. The two companies are currently collaborating on the supply of CTP batteries developed by CATL but will also explore various collaborations related to CATL's skateboard-type integrated chassis for EVs, "CIIC", to promote the transition to mobility. In addition, CATL has announced that by 2025, it will be possible to significantly reduce the manufacturing cost of EVs and increase the interior space by providing the world with CIIC chassis that integrates batteries, motors, management systems, etc.[21] Based on these, CATL is accelerating the development of overseas sales channels and local production overseas. From January to May 2023, CATL held the top share of the global automotive battery market (based on installed capacity) in January with 36.3%,

[18] Based on an article in the Yahoo Japan dated January 15, 2025. https://news.yahoo.co.jp/articles/50ea66ff5d83481be28fc058d3ea9471494d427b.

[19] "What's so great about CATL's lithium iron phosphate battery (LFP)? Comparing it with solid-state batteries", Hashimoto Research Institute, October 24, 2023. https://hasimoto-soken.com/archives/1958.

[20] Based on an article in the *Nihon Keizai Shimbun* dated November 1, 2022.

[21] Based on an article in the *Nihon Keizai Shimbun* dated November 2, 2022.

and overseas sales growth was almost double that of the same period last year. The company's overseas sales have doubled, and its overseas share of the company's total sales has expanded to just under 40%. However, not all CATL's overseas expansion has been smooth. In late July 2023, the US House of Representatives Special Committee on China and others are investigating CATL's partnership with Ford Motor. As competition for automotive applications intensifies, it is also necessary to develop applications other than automotive. CATL has already developed technology like "semi-solid batteries", a precursor to solid-state batteries, and is exploring the use of such batteries in electric aircraft and other vehicles. In short, in the 2020s, CATL is competing with BYD while opening its own platforms, such as EVBs and EV-specific chassis, to the outside world, in an effort to expand the EV ecosystem, which is "horizontally divided".

At the End

Based on the above facts and observations, the basic concern of this paper is how BYD and CATL gained a competitive advantage while building EV and EVB platforms from the perspective of a business ecosystem, and how they have developed their platform strategies. In accordance with the analytical framework shown in Figure 1, I have clarified the platform strategies by dividing them into the ecosystem establishment period, the transition period from ecosystem establishment to expansion, and the ecosystem expansion period.

First, the background to the establishment and expansion of the EV industry ecosystem in China includes the following factors: (1) Globalization and informatization that have progressed since 1900s have brought about major changes in product and process architecture, leading to horizontal division of labor. Unlike gasoline vehicles that are engine-centered and fine-tuned, EV structures have become more modularized with EVB at the center; (2) In the 2000s, the horizontal division of labor in the electronics and information industry in Southern China developed with the entry of foreign and private companies, while the automobile parts industry also grew; (3) From the perspective of energy security, the Chinese government quickly decided and implemented EV promotion policies as part of a "de-oil dependency" policy to escape from the current situation of heavy reliance on crude oil imports.

In this context, (1) during the establishment of the Chinese EV industry ecosystem, BYD and CATL entered the EV industry as their own closed domain of battery technology that complies with international standards, and while improving the technical level of their EVBs, they began encouraging domestic and foreign automakers to enter the industry; (2) During the transition from the establishment of the ecosystem to its expansion, BYD and CATL quickly cooperated with top-level automotive technology companies such as Daimler and BMW, won the turn at the inflection point of the government's EV promotion policy, and strived to gain leadership in intellectual property (IF standards for EVBs and EVs), improving their competitiveness while competing for a position at the market hub; (3) During the ecosystem expansion stage, BYD and CATL improved the competitiveness of EVBs while also developing chassis (platforms) dedicated to EVs, strengthening their bargaining power by entering domestic and foreign markets, stimulating and revitalizing surrounding markets and working to expand the EV ecosystem.

In this way, BYD and CATL have gained competitive advantages by utilizing the distinctive management resources they have accumulated over the years to build platforms for EVBs and EVs in response to changes in the external environment, such as the market and government policies, and have actively developed their platform strategies. Among them, there was a time difference in platform construction due to the differences in the business content of the two companies. CATL was relatively quick to build a platform centered on EVBs, while BYD

took time to build up its capabilities in not only batteries but also automobile manufacturing through "in-house parts production" and "vertical integration", but the scope of its platform is also wide. As a result, both companies are opening their own platforms, such as EVBs and EV-specific chassis, to the outside world to expand the EV ecosystem, which is "horizontally divided". As competition in the Chinese domestic market intensifies and Chinese companies expand into overseas markets, they face geopolitical risks, such as market restrictions in the US and additional tariffs from the EU. However, in the long term, the know-how in batteries and EVs will penetrate the global EV industry and help build a local EV ecosystem.

References

Chen, J. (2000). Growth strategies of Chinese passenger car companies. *Shinzansha*.

Chen, J. (2007). Competitiveness of China's manufacturing industry. *Shinzansha*.

Chen, J. (2012). Comparative analysis of changes in the Chinese automobile market and the strategies of Japanese, European, Korean, and Chinese companies. *Akamon Management Review, 11*(4), 255-275.

Chen, J. (2017). Research on new patterns of Chinese corporate growth: Building competitive advantage for DJI, the world's top commercial drone company. *Annual Report of the Japan Society for Industrial Science and Technology Research*, No. 32.

Chen, J. (2018). The light and shadow of China's rapidly growing smartphone market. *Asian Management Studies, 24*, 123-135.

Chen, J. (2023). Platform strategies of the Chinese commercial drone manufacturer: A theoretical and empirical study of ecosystem development. *International Relations and Diplomacy, 11*(4), 145-160.

Chen, J., & Jin, X. H. (2013). Strategies for Japanese auto parts manufacturing to enter the Chinese market, focusing on small and medium-sized Japanese parts manufacturers after China's accession to the WTO. *Ritsumeikan Business Management Journal, 51*(6), 21-37.

Ding, K. (2013). Current situation and issues of the local electronics and home appliance industry in Guangdong Province. Institute of Developing Economies Policy Brief, No. 21, September 2013.

Fan, Y. J. (2023). Fan Fan Talk: CATL vs. BiaDi, the Liang Yu love-hate relationship between Sanyuan and Tieli. *Electric Vehicle Resources EV Jianghu*, November 6, 2023. Retrieved November 3, 2023 from https://m.evpartner.com/jh/detail-52206.html

Fujimoto, T. (2002). Notes on the concept, measurement, and the strategy of product architecture. RIETI Discussion Paper Series, 02-J-008.

Fujimoto, T., & Shintaku, J. (Eds.). (2005). *Architecture analysis of China's manufacturing industry.* Toyo: Toyo Keizai Inc.

Gawer, A., & Cusumano, M, A. (2002). *Platform leadership: How Intel, Microsoft, and Cisoco drive indusitry innovation.* New York: Harvard Business School Press.

He, J. Y. (2022). Zeng Yuqun: Not he king of gambling, not the king of ning, but seeking to be a sage inside and king outside. *Sina Technology*, November 2022.

Iansiti, M., & Levien, R. (2004). *The keystone advantage: What the new dynamics of business ecosystems mean for strategy, innovation, and sustainability.* Boston: Harvard University Press.

Lee, K., & Malerba, F. (2016). Catch-up cycles and changes in industrial leadership. *Research Policy, 46*, 338-351.

Li, C. L. (1993). Domestic production strategies and supplier networks in Chinese passenger car production.

Li, Z. J. (2010a). The day when the world's largest electric vehicle market becomes an electric vehicle powerhouse. *The Economist*, March 23, 2010.

Li, Z. J. (2010b). BYD's great ambitions as it transforms from an EV manufacturer into an energy company. *The Economist*, November 23, 2010.

Liu, Y. (2022). China's lithium-ion battery industry in the past ten years: Europe and the United States are in the lead, Japan and South Korea are overtaking, and Chinese companies are catching up. *Autohome*, September 30, 2022. Retrieved May 10, 2023 from https://chejiahao.m.autohome.com.cn/info/11245837

Maruyama, M. (2011). *Business economics.* Yuhikaku.

Song, N. (2015). The 20-year transformation and development history of BYD/Chinese brand. *Autohome/Car Home*, May 23, 2015. Retrieved June 12, 2023 from https://chejiahao.autohome.com.cn/info/1022850/

Sugiyama, Y., Nagauchi, A., Kameoka, K., & Funatsu, S. (Eds.). (2023). *The management of cross-border collaboration: Business process across organization and national borders.* Hakuto Shobo.

Tachimoto, H. (2017). Global strategies of platform companies. *Yuhikaku.*

Tanaka, N. (2022). Will BYD, a late-blooming Chinese powerhouse that provides core technology to Tesla and Toyota, change the automotive industry? NEC/Orchestrating a brighter world. June 27, 2022.

Tang, J. (2018). Tesla's Shanghai launch: A black ship in China's EV market. *Nikkei Business*, August 28, 2018.

Wang, D. Y. (2020). Lithium Iron Phosphate "Counterattack". *Securities Market Weekly*, December 2, 2020. Retrieved November 15, 2023 from https://wisdom.nec.com/ja/series/tanaka/2022062801/index.html

Zheng, X. H. (2009). *Wang Chuanfu: The Father of BYD*. Beijing: Central Compilation and Translation Publishing House.