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*Article*

# A Critical Review of NIO's Business Model

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**Abstract:** The present study reports a critical review of NIO's business model, considering the evolving landscape of the electric vehicle market and servicing. The objective of this study is to develop a comprehensive framework that facilitates the identification of key elements characterizing a company's business model and highlights ongoing transformations, crucial for adaptation and survival in a rapidly changing environmental context. Focusing on the case study of NIO, a relatively young Chinese original equipment manufacturer (OEM) specializing in high-tech electric cars, the research delves into the challenging scenario of the Chinese electric vehicle market, which has recently faced a bubble in 2023. The market proliferation, supply chain disruptions, and price wars triggered by Tesla have resulted in a survival struggle for numerous automotive startups, leaving larger companies with increasing market shares. Despite facing adversities, NIO managed to secure a promising segment, catering to premium-range battery electric vehicles (BEVs), establishing a competitive advantage through differentiation. By pursuing ambitious investments, the company aims to create economies of scope and achieve cost leadership, venturing into new market sectors and vertically integrating the production chain. Given NIO's agility in adapting to market conditions, aggressive entry into new segments, and a strategic vision for the future, it serves as an excellent candidate for testing and validating the proposed framework. The research sheds light on NIO's trajectory and offers insights into its potential for sustained growth in the dynamic electric vehicle market.

**Keywords:** electric mobility; market disruptions; competitive advantage

## 1. Introduction

In the last twenty years, the strong technological evolution in the automotive sector has opened new market prospects for vehicles based on purely electric traction and powered by batteries, known as Battery Electric Vehicles (BEVs), which, although still more expensive compared to equivalent internal combustion products, are currently afflicted with significantly fewer issues than in the past. Indeed, the first lead-acid battery electric vehicles were already introduced in the early 1900s in the United States. However, reliability problems with the batteries and their need for continuous maintenance, along with limited power for use outside urban areas and the absence of a charging infrastructure, led to their defeat compared to the internal combustion engine technology [1]. Starting from the 1990s, remarkable progress in increasing the autonomy of lithium-ion batteries, combined with the availability of widespread fast charging solutions, contributed to the revival of electric vehicle technology. Simultaneously, the clean energy automotive industry received significant global support from governments, recognizing its crucial contribution to reducing greenhouse gas emissions, the main culprits behind climate change. This technological paradigm shift has prompted numerous automotive companies to reconsider and transform their business models in response to changing environmental conditions, new opportunities, and emerging risks [2].

In the same historical context, the phenomenon of servitization has also emerged, representing the increasingly predominant trend of car makers offering a multitude of services, often more profitable than the products themselves [3]. In addition to traditional ancillary services such as routine maintenance or roadside assistance, new offerings have enabled various forms of single, multiple, or periodic remunerations, closely integrated with the latest technologies installed in vehicles, such as advanced onboard computers, connectivity, and artificial intelligence. The electric

architecture itself has facilitated the commercialization of functionalities that would have been challenging to implement with traditional powertrains. For example, Tesla allows its customers to unlock additional power or autonomy on their vehicles for a fee after a trial period [4]. In the near future, new forms of servitization will leverage network technologies and autonomous driving, enabling service propositions detached from vehicle ownership but focused on the end result, such as booking trips in shared vehicles or using driverless robotaxis.

### *1.1. Research aim.*

Using the reference case of the electric vehicle market and servitization evolutions, this study aims to develop a framework that facilitates the description of the characterizing elements of a company's business model and succinctly highlights ongoing transformations. The framework enables defining the necessary evolutionary path for a company's adaptation and survival in a renewed environmental context. Alongside the methodology development, the paper presents a case study of a relatively young original equipment manufacturer (OEM), the Chinese company NIO, which has been involved in the design, development, and production of high-tech electric vehicles since 2014. In 2023, the scenario in which NIO operates, the Chinese electric vehicle market, has taken the shape of a bubble. The relative ease of producing battery-powered vehicles, compared to internal combustion ones, combined with strong government incentives for ecological transition, led to a proliferation of automotive startups specialized in electrification. By 2019, there were over 500 such startups, but within four years, the number of active companies reduced to a fifth due to market contraction, supply chain disruptions (caused by the government's "zero-covid" policy), and the price war instigated by Tesla. In this context, companies with larger market shares became increasingly dominant, while startups struggled to survive [5]. Despite facing challenges that threatened its survival, NIO swiftly captured a fertile segment - premium-range BEV cars - and through ambitious investments, acquired a competitive advantage based on differentiation. In the medium term, with significant investments, the company is striving to build economies of scope, ensuring future cost leadership by entering new market sectors and verticalizing the production chain. NIO's ability to adapt quickly to market conditions, its agility in entering new segments, and its declared strategic vision for the upcoming years make it an ideal candidate for applying and validating the developed framework in this study.

## **2. Methodology**

### **3. The NIO case**

#### *3.1. Battery-Swap Adoption in China: The Emergence of NIO*

China has become the nation with the world's largest automotive market in the last two decades, surpassing 23 million vehicles sold in 2022 (almost twice the number of vehicles sold in the United States, ranking second in the global market size), with an average annual growth rate of 17.5% since 2000 [6,7]. With the electric revolution, the predominant model of the Chinese automotive industry, which relied on joint ventures with well-known Western brands, is gradually losing significance. Since the beginning of 2022, the Chinese Ministry of Commerce has removed the joint venture requirement for foreign automotive companies operating in the country, allowing the establishment of wholly-owned local factories and facilitating the entry of new foreign automakers. In the EV sector, the knowledge gap between Chinese and Western industries is considered much less significant than the expertise accumulated by European and American manufacturers in internal combustion engine development, providing a substantial development opportunity for the local industry.

Simultaneously, a historic milestone was achieved in 2022, as for the first time, half of the vehicles sold in China were manufactured entirely by domestic OEMs [8]. In 2022, one out of every four vehicles sold was a NEV (of which 74% were BEVs), with local manufacturer BYD leading the market (30%), followed by the joint venture SAIC-GM (9%), TESLA (9%), and Chinese manufacturer GEELY (5%). Projections indicate that by 2025, electric and plug-in hybrid vehicles will constitute

13% of the entire circulating vehicle fleet in China, double the forecast for Europe and triple the forecast for the USA [9].

In this context, in 2014 the Chinese entrepreneur William Li launched the NIO brand, [10]. NIO has been listed on the New York, Singapore and Hong Kong stock exchanges since 2018; in 2020 a follow-on offering was made in order to finance the development of new products, the expansion of the network and the penetration of new markets, including the European one [10]. NIO has established itself over the years as one of the most successful automotive start-ups with a different form of technology compared to almost all of its competitors: the battery-swap, supported by proprietary swap stations that allow the complete restoration of the vehicle's autonomy in 4-5 minutes, thanks to the automated replacement of the exhausted battery with a fully charged one.

The battery-swap technology contrasts with the more common slow-charging technologies for various technological and economic reasons:

- It contributes to reducing range anxiety, provided that the swap station network is sufficiently extensive.
- It eliminates concerns about battery wear and potential accelerated vehicle depreciation, decoupling the value of the two (a particularly significant factor in the used car market).
- It allows the use of different battery types while maintaining a consistent mechanical interface. For instance, users could choose between a low-cost and lightweight battery for urban mobility or an enhanced one for longer journeys. Moreover, more advanced batteries may become available over time and be compatible with vehicles purchased in previous years, avoiding the obsolescence of the entire vehicle.
- It drastically reduces the time required for a full charge, from the range of 6-12 hours (Mode 2 charging) or 3-4 tens of minutes (Mode 4 charging) to the range of 1-6 minutes (battery-swap).
- It does not exclude traditional or fast-charge charging methods, which remain available to ensure compatibility with the most common charging stations.
- It enhances battery safety and durability, as the charging cycles of batteries in stock are consistently controlled.
- It significantly lowers the vehicle cost, enabling the adoption of hybrid business models based on ownership or servitization for the vehicle and various forms of servitization for the battery and charging. Generally referred to as Battery-leasing, when the battery is offered under some form of periodic rental at a certain rate. The evolving model, also adopted by NIO, is called "Battery as a Service" (BaaS). In this case, the contract covers the service itself, including maintenance, warranty, remote diagnostic monitoring, and battery swapping. The periodic rate may vary, depending on the selected battery capacity, the number of months the contract remains active, and the monthly distance covered, including a certain number of monthly battery swaps at the swapping stations [11]. The BaaS service is generally more flexible than Battery-leasing, allowing easy upgrades to batteries with larger capacity, including the use of fast-charge charging stations, or flexible termination of the contract.

Note also that, if Neighborhood Electric Vehicle (NEVs) achieve mass adoption comparable to that of current Internal Combustion Engine (ICE) vehicles, the use of fast-charging stations during peak energy demand periods could lead to an overload of the national electric structure, resulting in the risk of blackouts due to high demand. Conversely, battery-swap systems can contribute to better balancing the national electric and energy structure: the stations are capable of intelligently recharging the stored batteries, concentrating energy absorption during less congested periods of the day and making better use of renewable sources, or even supplying the stored energy back to the grid in critical situations.

NIO opened its first swapping station (called Power Swap Station) in 2018 in Shenzhen, and by the end of 2022, it had over 1200 stations in China, with plans to reach 2300 stations by the end of 2023 [12]. As of the time of writing, NIO is the world leader in battery swapping technologies and BaaS services [13]. The idea of battery-swap is not entirely new in recent history; Renault attempted to introduce this technology in 2009 with the launch of the Fluence Z.E. model, supported by the Israeli company Better Place, tasked with developing the battery swapping infrastructure. However,

Better Place declared bankruptcy in 2013 with a deficit of 800 million dollars, facing evident cash-flow problems due to the low market penetration of the product, despite significant investments required for widespread adoption of the swapping stations, which resulted in the unit cost increasing from the initially projected 500 thousand dollars to two million dollars [14]. Tesla also announced a similar technology in 2013 but never actually launched it on the market, citing low interest from potential consumers. Currently, the closest comparable analogy to NIO's technology is provided by the Chinese state-owned company BAIC, which initiated a battery replacement service primarily targeting the B2B market, producing exclusively vehicles used as taxis, a significantly different business model from NIO's B2C approach.

In 2020, battery-swap systems were included in the Chinese government's plan for strategic investments in 2021-2035 [15], formalizing political support that restarted the race for technology development, attracting new potential entrants. Therefore, although the technological idea is not new, the timing for the introduction of this technology is much more favorable than in the past. A 2021 estimate predicted that by 2025, the number of NEVs in China equipped with removable batteries could exceed 1.2 million units, with an estimated need for at least 1200 stations nationwide [15]. After just two years, NIO had already built such a number of stations, having produced over 300,000 vehicles in the meantime [16,17].

In May 2021, NIO revealed its plans for expansion into Europe, officially commencing sales in Norway. In October 2022, the availability of three new models was announced in Germany, the Netherlands, Denmark, and Sweden, with the intention of building 120 Power Swap Stations in Northern Europe by the end of 2023, along with the inauguration of an R&D center in Berlin focused on autonomous driving and infotainment [18]. By the end of 2022, NIO had over 15,000 employees, including over 700 in Europe.

NIO's value chain is profoundly different from that of Western OEMs but common to other Chinese NEV manufacturers. The vehicle construction is not done directly by NIO but through a joint venture with JAC Motors, a state-owned manufacturer with whom the agreement has been confirmed until 2024. NIO is responsible for business model development, vehicle design, engineering, supply chain, quality assurance, and production techniques, while assembly and operations management are entrusted to JAC. Battery production is also not directly performed by NIO but mainly outsourced to the Chinese giant CATL, which as of Q1 2023, held the position of the world's largest battery manufacturer with a 35% share of the global market [19].

Although a five-year strategic collaboration pact was renewed between the two companies at the beginning of 2023, NIO has simultaneously sought ways to reduce its dependence on CATL. New suppliers like CALB and WeLion have been introduced, the former focused on supplying batteries for the latest models and the latter for designing and producing new-generation 150kWh batteries with solid-state technology. Additionally, investments in proprietary cylindrical cell factories have begun, capable of supporting 800V charging (technologically similar to those used by Tesla), leveraging the expertise of a dedicated team of 400 individuals in battery research and development. The construction of the first such factory in Hefei began in February 2023, with operations expected to start by 2024. Finally, strategic alliances have been formed with raw material suppliers, such as NIO's equity investment in the Australian lithium supplier Greenwing Resources, to mitigate potential supply chain bottlenecks [20].

### *3.2. Product innovation and brand strategy*

NIO's name in Chinese is "Weilai" and is translated into English as "Blue Sky Coming". The NIO logo encompasses heaven (symbolizing vision, openness, future) and earth (symbolizing action, direction, and momentum) [21] - see **Error! Reference source not found.**





**Figure 1.** The NIO logo and its definition. Source: nio.com.

The company's stated mission is to "shape a joyful lifestyle by building a community through intelligent electric vehicles, to share joy and grow together with users." The image that NIO aims to create is, in fact, that of a highly recognized brand that is close to the consumer, with interactions not limited solely to the cordialities exchanged during the vehicle purchase and delivery phases, seeking to implement a product differentiation strategy in a highly crowded BEV market, composed of around 200 electric vehicle manufacturers in China alone in 2022 [22]. NIO's vision revolves around "creating a sustainable future by redefining the automotive industry," as suggested by the components of its logo.

Forbes reports that 73% of consumers consider the customer experience a critical factor in establishing brand loyalty and that 84% of customers are convinced to purchase a product if recommended by someone they know [23]. It is possible to analyze how NIO has built its marketing strategy around these two pillars: customer loyalty and referrals. NIO co-founder Qin Lihong himself stated a preference for investing in services that can increase perceived quality rather than in billboard advertisements. He cites the example of the additional services provided by NIO during the traditional annual exodus from cities to suburban areas that takes place before the Chinese New Year: with a moderate investment, the company was able to offer a series of extra benefits, from car washes to emergency roadside assistance, in addition to free battery swaps. Lihong also states that approximately 60% of new sales are due to referrals from existing customers to acquaintances [24], confirming the validity of Forbes' statistics. To gain the trust of European consumers, NIO launched its vehicles with an extended 5-year warranty (extendable to 10 years) inclusive of free roadside assistance for the same period. The leasing packages already include a complete range of services, such as an extended monthly mileage limit (1250 km per month), insurance, winter tire changes, and discounts on home charging stations. Additional insurance coverage, such as scratch and accidental damage protection, can also be added. Orders can be placed online, with the option of free delivery (and pick-up in the case of transferring ownership of a used NIO vehicle) to one's home or a NIO House. The combination of these services, referred to as "worry-free services," helps not only maintain high customer satisfaction and a perception of a premium brand but also creates value throughout the entire lifecycle of the vehicle product. The services can be booked through the app, which also serves as a monitoring and remote diagnostic tool, automatically exchanging necessary data for connected assistance in case of issues.

NIO has decided to fully focus on the social aspect of word-of-mouth, both offline and online. The offline channel that NIO emphasizes the most is represented by the construction of "NIO Houses," multifunctional showrooms designed to offer users an interactive area where they can get to know and experience the vehicles. The NIO Houses are defined by the company as "an open and pleasant place where NIO enthusiasts can share their interests and experiences together" and are located in strategic areas of cities, characterized by spacious and modern designs, equipped with conference rooms, libraries, bars, recreational areas for children, and workstations with seating. They host events such as public readings, yoga classes, art moments, and are generally designed as spaces available to the community, with 110 locations worldwide as of April 2023 [25]. It is evident that NIO aims to create a "brand community" model based on word-of-mouth and brand loyalty - analogous to what IKEA did with Swedish meatballs served in their store restaurants and the common areas made available, adding attributes to traditional showrooms to enhance the sense of community among brand loyalists.

In addition to NIO Houses, there are larger "NIO Delivery Centers," which, in addition to featuring the characteristic elements of NIO Houses, offer customers the option to pick up their vehicles in person instead of waiting for home delivery, providing assistance for the initial configuration. The vast areas are also used for test drives, after-sales services, and to serve as a point for returning used NIO vehicles.

The company has also set up an e-commerce system accessible through the smartphone application ("NIO App"), where a wide selection of branded products labeled "NIO Life" is available, created in collaboration with famous designers. These products range from antibacterial T-shirts to eco-friendly home products, high-quality wines, kitchen utensils, electric bicycles, and cookies [26]. The system is integrated into the app together with various social network functionalities where NIO customers can interact directly with each other, post content, and exchange their experiences. Several of these products have won international design awards, demonstrating that NIO's strategy is not only to put its brand on commonly available merchandise but also to create highly differentiated and recognizable objects [27]. The penetration of NIO Life products exceeds 50% among NIO vehicle owners, associated with an average annual spending of \$300 per customer [28].

NIO's product strategy for different customer segments initially followed a similar path to that of Tesla and other automotive startups: starting from the high-end segments, with focused and highly rewarding products, to create the new brand image and fund the development of more affordable models for the mass market. By doing so, they could then implement a strategy focused on penetrating new customer segments (see Figure 1). for reference. Li stated his intention to enter the Volkswagen market segment by 2024, introducing a compact car with a list price below €30,000, using a new brand reserved for more affordable vehicles, with "a brand relationship similar to that between Audi and Volkswagen," aiming to provide "better and more affordable products and services than Tesla" in both China and Europe [29,30,31,32]. It is worth noting that the five Northern European countries chosen by NIO for their European launch are among the top 13 in terms of per capita GDP on the continent (top 10 if Luxembourg, Switzerland, and Iceland are excluded) [33]; the arrival of more affordable models could enable penetration into customer segments traditionally oriented towards the mass market, as found in Spain, Italy, and France.

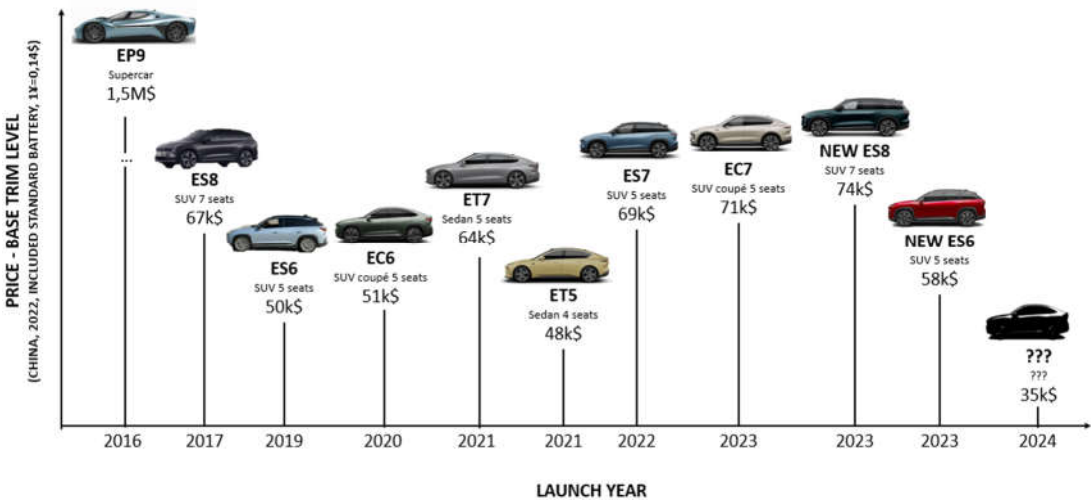


Figure 1. NIO product line pricing and launch year for each model (pre-Chinese price war prices).

The implementation of the battery replacement system carried out by NIO is conceptually user-friendly, fully automated, and has a total duration of less than 6 minutes. The vehicle is manually positioned by the driver in a specially marked area, perpendicular to the entrance of the station. Once the car is parked on the platform, a button appears on the onboard infotainment system. When pressed along with the brake pedal, it initiates the process: the vehicle maneuvers autonomously and positions itself inside the charging station, precisely aligning for battery exchange. After centering, a robotic process unscrews the depleted battery from the undercarriage, which is then stored in the warehouse through a conveyor belt. The fully charged new battery is retrieved from the storage and

installed using the reverse process. Throughout the procedure, no intervention is required from the driver, who doesn't even need to exit the vehicle. The removed battery is automatically analyzed before undergoing charging, and if any issues are detected, it is sent for repair [34]. In April 2023, NIO announced that when associated with the NOP+ (Navigation on Pilot Plus System) autonomous driving service, the battery-swap service will become even more automated: the vehicle will be capable of heading towards the highway exit, completing the battery exchange, and rejoining traffic without any intervention from the driver [35]. As of today, a so-called second-generation station can store 13 batteries and carry out 312 daily replacements. Third-generation stations, expected to arrive starting from autumn 2023, will be able to store 21 batteries and perform 408 daily replacements; they will reduce the average battery replacement time by one minute and will be natively equipped to provide stored energy to the power grid – a usage that could help balance peak demand on the grid and enable a new form of compensation [36].

In addition to the swap stations, NIO is deploying public fast-charging stations (referred to as "NIO Power Charger") capable of supporting 180 kW charging. In any case, NIO has equipped its vehicles with standard charging ports, allowing them to charge at non-proprietary public charging stations, thus countering the initial limited availability of swap stations. Additionally, NIO offers two variants of home charging stations [37–40]:

- The Power Home, a compact 7 kW wallbox charger that enables the charging of a 100 kWh battery in 14 hours, with free supply and installation provided with the first vehicle purchase.
- The Power Home Plus, larger but capable of providing 20 kW of power, tripling the charging speed.

### 3.3. NIO: Business Model Analysis

The authors analyzed how the main technical factor of differentiation for NIO's product is the battery-swap feature. The cost of a battery-swap station has never been publicly disclosed by NIO. A study by Halmstad University in 2021 estimated a cost in China of approximately 700,000 euros per station, including start-up costs and batteries, compared to the 280,000 euros required for a fast-charging station [15]. However, with increasing economies of scale and the progress of the learning curve, the gap between the two investments is decreasing. As of the time of writing, NIO claims to have built over 1300 stations in China, initiated construction in Europe (with 16 stations already completed as of May 2023 and a target of 120 by the end of 2023), and aims to have at least 4,000 stations deployed globally by the end of 2025, with 1000 of them outside China [41]. This allows us to estimate a total investment of approximately three billion euros by that time. NIO has never wanted to outsource the swap service, justifying that the long-term cost of ensuring the same level of customer satisfaction with partner operators would be significantly higher.

NIO's President, Lihong Qin, has publicly emphasized the importance of quality as a fundamental element for building a lasting relationship with the customer, which does not end with the vehicle's delivery at the dealership but enables multiple direct and service-related sales over time. NIO seeks to reverse the concept of traditional OEMs that historically focus most of their efforts on maximizing short-term sales. According to Qin, creating more value and achieving "brand premium" status also has another advantage: allowing Chinese-made vehicles to have a similar or even higher selling price compared to equivalent German or Japanese vehicles, which are on average 20% more expensive for a similar product [28]. The financial difficulty lies in having to advance capital for investments that will not yield immediate financial returns (typically, marketing initiatives must generate an ROI within a year from the cash outflow), but these investments should be evaluated in relation to the entire product lifecycle. In this sense, investment in new and improved services is initially rewarded in terms of customer loyalty and increased referrals. As demand is saturated, thanks to the increase in volumes and new customers utilizing these services, the return becomes more apparent. At the beginning of 2023, the CEO of NIO confirmed the intention to maintain this strategy and not to sacrifice investments in customer services, including swap and charging stations, in order to continue building the perception of a premium brand, even though the company's profitability is taking time to arrive [42].



In the same interview, Qin reiterates the importance of managing accessory products such as car wash and mechanical parts upgrades, which are directly operated by NIO in its own Service Centers, rather than by third parties. Even the trade of NIO Life products, which in the balance sheet of a traditional OEM would have marginal economic relevance, becomes part of the NIO ecosystem, contributing not only to generating revenue but also spreading the brand's image of quality and community membership. **Error! Reference source not found.** summarizes the pillars of NIO's business model strategy discussed so far: direct sales of vehicles and batteries (including options, potential upgrades, and used vehicles); subscription services that ensure recurring revenue (Battery as a Service, Adas as a Service, Car Rental); direct operation of accessory Aftersales services and Nio Life products; a strong community, thanks to loyalty and referral systems (such as Nio Credits and Nio Points) and the spread of physical meeting points like Nio Houses; Nio Power services, accessible to NIO customers and partly to owners of other electric vehicles



**Figure 3.** The pillars of the NIO Business Model.

The first commercial proposal of NIO included an unlimited and free lifetime battery-swap feature, imitating the successful model initially implemented by Tesla, which offered unlimited charging to its customers (until the end of incentives in 2016 when Tesla declared the long-term economic unsustainability of such a business model business [43]). The number of free battery swaps per vehicle was progressively reduced with new contracts; in 2023, with the BaaS service, customers were entitled to up to four included swaps per month in the Chinese territory and up to two included swaps per month in the European territory [44].

Since 2021, there have been four main contractual options offered by NIO in China:

- Purchase of the vehicle without the battery and rental of the battery (BaaS). By avoiding having customers purchase the battery, NIO can offer vehicles on the market that are up to €8,500 cheaper than the list price [11], requiring in return the subscription to a BaaS plan starting from €130/month. Four battery swaps per month are included, beyond which each additional swap becomes a paid service. It is possible to change the battery every month (and from 2022, in some cities, even daily) with a battery of different capacity and cost, according to one's needs [45]
- Purchase of the vehicle without the battery and rental of both the battery and all charging services. This option is similar to the previous one but also includes the possibility of using fast-charging stations.
- Subscription of the vehicle and battery, at a decreasing monthly cost, with four included battery swaps per month - this service is available only in some cities [46].
- Purchase of the vehicle and battery together. It is possible to use the battery-swap service even if the battery has been purchased. This may seem counterintuitive, but it is based on the observation that battery owners, after avoiding swaps for the first few months, lose interest in having a "new" component compared to the advantage of being able to use the battery-swap service [47].

In 2020, the subsidiary "NIO Financial Leasings Co." was set up, with the task of facilitating vehicle financing by offering rates lower than those on the market. In 2022, the possibility was added to withdraw from the rental agreement and to be able to purchase the battery separately for customers who had subscribed to one of the last two methods, upon payment (in addition to the cost of the battery) of a "service fee" [48].

With the opening of the European market, specific subscription models have been introduced for Western countries:

- Leasing of the vehicle through third parties; in reality, leasing partners buy the vehicles directly from NIO and then activate leasing contracts with the end consumer. This option is exclusively dedicated to corporate customers and not to private individuals [49,50].
- Short- or long-term vehicle and battery subscription, with flexible durations from 1 to 60 months, including insurance, maintenance, battery swaps, free charging for the first 6 months, and the option to return the vehicle at any time. The monthly price decreases progressively if the subscription remains active.
- Fixed-term rental of the vehicle and battery (from 12 to 60 months), including all the features of flexible leasing but with a 10% reduction in costs compared to the minimum rate of flexible leasing, at the expense of a predetermined and unchangeable rental period.
- Purchase of the vehicle without the battery and rental of the battery (BaaS). In this case, customers save between €12,000 and €21,000 (depending on the capacity of the chosen battery) with a subscription ranging from €169 to €289 per month. It is also possible to finance the vehicle at a lower interest rate than the market rate [51]. Two free battery swaps per month or 200 kWh of fast charging are included, beyond which each additional swap or charging becomes a paid service (€10 per swap + €0.20 per kWh) [52]. By way of comparison, at the beginning of 2023, the maximum cost for an additional swap was €30, half the average price of a conventional fast charge [53]. It is not possible to terminate the BaaS and purchase the battery at a later time, unlike what happens in China, but NIO has opened up this possibility in the future [47].
- Purchase of the vehicle and battery together. In this case, it is not possible to use the battery-swap stations, unlike what is allowed in China [54].

The options for the European market have been expanded over a few months; at launch, only the rental of the vehicle and battery together was planned, but later on, direct sales were introduced, probably also to address the initial shortage of swap stations in the European territory. In most regions, NIO offers "worry-free" insurance services, as mentioned earlier, all activated via the app and including vehicle pick-up and home return. The direct sale of certified used vehicles by NIO is also available through the app, for now only in China.

In June 2023, to respond to the price-war of BEVs in China in a sustainable way for the company's budget, NIO cut the prices of all new models by \$4,200. However, they eliminated the lifetime free battery swap for new customers and introduced it as a separate one-time package priced at \$3,900, which includes four free battery swaps per month for life, free lifetime connectivity and roadside assistance, and an extended 10-year warranty [55].

Figure 6 shows the combinations of PSS (Product-Service Systems) offered by NIO as described so far, based on the classification by Gaiardelli. It can be observed the coexistence of:

- PSS historically offered by most OEMs, predominantly transactional in nature, both product-oriented (new and used car sales, repairs, aftersales services) and use-oriented (corporate leasing, short-term rentals).
- PSS currently offered by most OEMs, predominantly relational in nature, both product-oriented (periodic maintenance, financing) and use-oriented (long-term rentals).
- Innovative PSS of a relational nature also offered by other OEMs, product-oriented (such as remote diagnosis, on-demand assistance, used vehicle pickup), or use-oriented, like subscription-based features, primarily Adas as a Service.
- Innovative PSS for which NIO can claim a marked competitive advantage, predominantly relational and classified as at the boundary between use and result: variable-duration vehicle subscription services including battery swap, charging subscriptions, and of course, BaaS. In this

category, the authors also included those of a transactional nature, such as on-demand Power Mobile charging, single charging at NIO-owned charging stations (open to competitors' vehicles as well), new battery sales, the range of NIO Life products, and community services offered in NIO Houses.

Lastly, it is necessary to consider the company's future strategy. Executives have repeatedly expressed interest in transitioning to a Mobility as a Service model, where NIO-produced vehicles become part of an integrated mobility system, providing a user experience fully oriented toward the outcome [56]. In 2019, NIO formed a partnership with Mobileye (a company owned by Intel) to supply vehicles equipped with level 4 autonomous driving systems. As part of this collaboration, tests began in Germany at the beginning of 2023 to launch a robotaxi service consisting of an ES8 fleet [57]. NIO is also among the financiers of the startup Pony.ai, one of the first companies in China to obtain a license for completely autonomous taxi operations, authorized to operate without a control driver on board [58]. At the end of 2022, NIO entered into another partnership with the tech giant Tencent, focused on developing high-precision maps and using cloud technology to create advanced self-driving algorithms. Although NIO has not yet directly capitalized on these investments, it is reasonable to assume that it could strongly enter this sector in the short to medium term. The authors depict the likelihood of future outcome-oriented and purely relational PSS proposals, such as robotaxi services and other potential future MaaS applications, in a paler color in the top right corner of the diagram in **Error! Reference source not found.**.

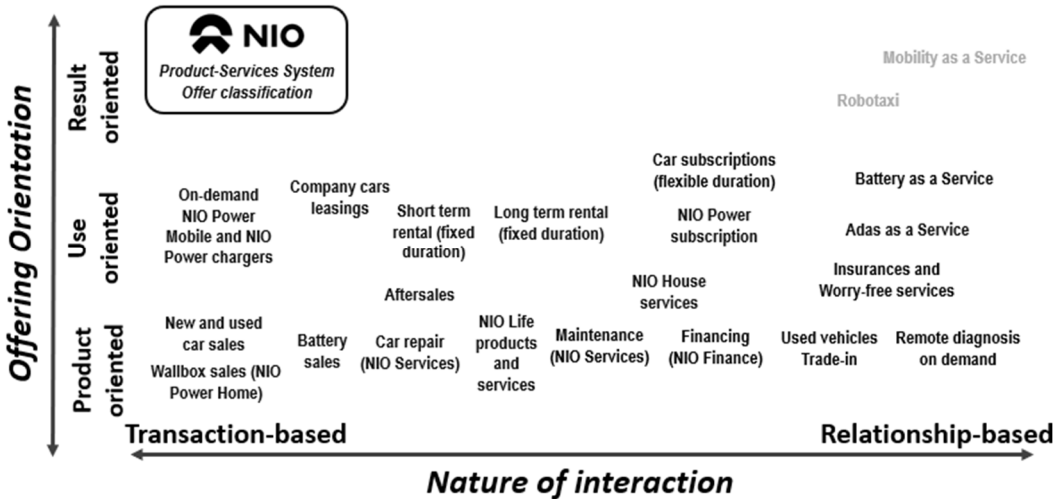
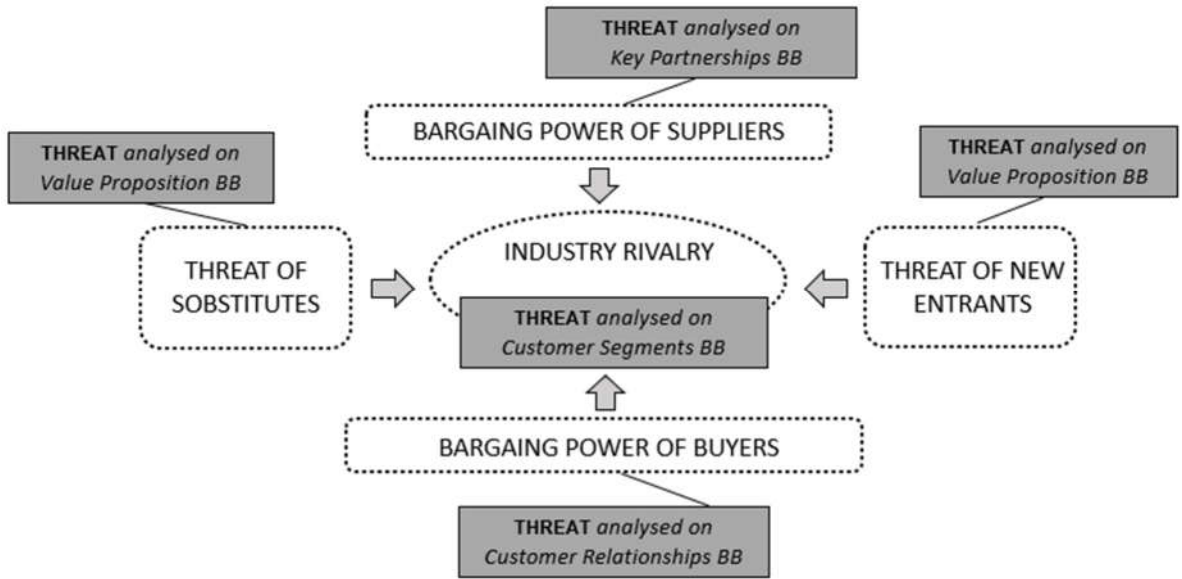


Figure 4. NIO Classification of PSS offered by NIO

3.4. NIO: Building the Business Model Canvas

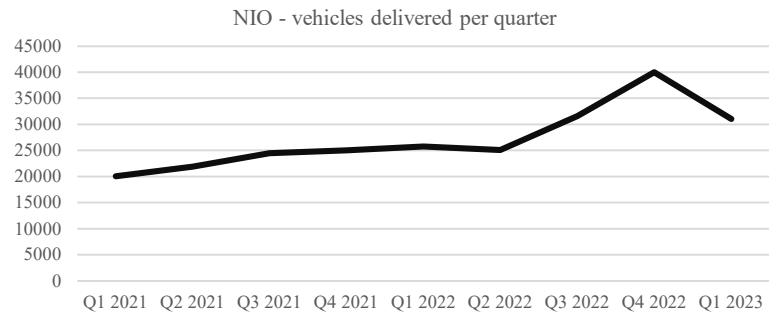
There is now have enough data to construct the NIO business model in order to consider the evolutionary steps that need to be taken to ensure its future profitability (**Error! Reference source not found.**) [59]. The authors complete the Strengths and Weaknesses quadrants of each SWOT matrix, aiming to provide a concise overview of each Business Block (BB). The BMCs (Business Model Canvases) thus created are analyzed, and a possible evolution of the business model (referred to as the "future BMC") is identified, taking into account the recent strategic moves made by the company, financial balance data, and publicly released statements. For the sake of brevity in this document, only certain BBs are included, such as Customer Segments, Value Proposition, Channels, Customer Relationships, and Revenue Streams. On the other hand, Key Activities, Key Resources, Key Partners, and Key Partners BBs are schematically presented in the discussion section.



**Figure 5.** Porter's five competitive forces and the relationship with Threats analyzed in the BB of the BMC.

3.4.1. BB Customer Segments

**S:** NIO confirms its ability to progressively expand its customer base through the introduction of diversified products, as evidenced by the increasing deliveries in recent years (see **Error! Reference source not found.** [60,61]) and the intentions to launch eight new models starting from 2023. With ongoing collaborations and advanced experiments on autonomous driving, NIO is also preparing for a new type of outcome-oriented clientele, which will utilize robotaxis and level 5 autonomous vehicles in the future.



**Figure 6.** Global trend of quarterly deliveries of NIO vehicles.

**W:** It is necessary to consider that in areas far from swap stations, the attractiveness of NIO vehicles may be lower and comparable to that of other electric vehicles. To maintain high differentiation, leveraging other distinctive factors is essential due to the high level of competition.

**O:** The global market for Battery Electric Vehicles (BEV) is continuously rising, supported by national and federal governments, with renewed opportunities for entry into lower segments due to government incentives. Regarding BEVs, the share of the European market dominated by Chinese brands is significantly increasing, reaching 5% in 2022 and projected to be between 9% and 18% by 2025 [62]. While the average price for BEVs in China has decreased by over 50% since 2015, it has increased by 14% in Europe, providing significant opportunities for Dragon OEMs to enter the European market, [63].

**T:** It is natural to identify the main competitors of NIO in the premium segment of the BEV sector. The crowding of the high-end segment in China is justified, as it represents only 12% of the automotive market but generates 50% of OEM profits [64]. Tesla remains the main competitor,

especially after opening the Shanghai factory in 2019, which allowed reducing the applied price points in the country. NIO's leadership, while recognizing the importance of Tesla, focuses more on German brands such as BMW, Mercedes, and Audi as direct rivals, given their concentration in the premium sector and established customer base in China. The CEO of Volkswagen (and Audi) has also acknowledged NIO as a new competitor [65]. William Li has identified Apple as the "ultimate rival" in the long term, which, with the rumored entry into the automotive sector, could find the winning mix of technology and humanity, values that perfectly align with NIO's [66].

**BMC FUTURE:** In the long term, NIO will consolidate its offerings for mid and mass-market customers using two new dedicated brands for each segment, necessary to maintain the value of the current brand. The announced intention is to strengthen its presence in Europe, which currently represents a significant opportunity for Chinese car manufacturers. Speculations also suggest an imminent entry into the Arab market, following an investment from the Abu Dhabi government. With the increasing number of competitors, especially in the lower segments, it will be essential to continue providing differentiation beyond the swap technology and maintain low rates of customer abandonment to other OEMs. NIO is also preparing for Mobility-as-a-Service (MaaS) in both China and Europe, continuing to develop its advanced autonomous driving algorithms and engaging with new service providers like Mobileye and Pony.ai.

### 3.4.2. BB Value Proposition

**S:** NIO customers recognize the high-quality levels of the vehicles, as confirmed by various independent companies specialized in Quality & customer satisfaction evaluation. The marketing research company J.D. Power has awarded NIO several first prizes in the NEV category in recent years [67], while the Chinese Automobile Quality Network ranked NIO seventh out of 26 most relevant electric vehicle manufacturers operating in the Chinese market in its 2023 Brand Quality Ranking [68]. The company has demonstrated its ability to respond quickly to market demands, adapting subscription methods according to the geographic region and updating them rapidly based on market response.

**W:** With an increasing number of customers and served regions, it will be essential to maintain high quality levels and make the brand known. European markets have strong local brands with an extensive network of dealerships available as reference points [62].

**O:** Compared to the past, the European market has become more interested in new brands and alternative transaction methods, partly due to the continued increase in prices of European brands in the post-pandemic period. The preference of younger generations for subscription models is growing, along with the demand for immediacy in mobility services utilization.

**T:** Porter's model indicates threats from substitute products and new competitors entering the market due to the rapid technological evolution of batteries. Charging capacity is rapidly increasing, with energy density multiplying approximately 8 times from 2008 to 2020 [69]. and technologies that accelerate charging are continuously developing, aiming to fully recharge a vehicle in under 10 minutes within 5 years [70]. Tesla's Supercharger V4, installed in March 2023, delivers 40% more power than current ones [71]. Over time, the utility of swap stations may diminish due to the growing range and charging speed of electric vehicles, raising concerns among analysts [34]. The threat of new entrants in the sector remains high, including third-party swap station providers. NIO uses a proprietary battery exchange standard, while the Chinese provider Aulton serves 30 different vehicle models from 16 OEMs on a single station [41]. OEMs with removable batteries might benefit from existing infrastructures or government decisions pushing for a unified standard [72]. New providers like Ample and CATL's BaaS model could absorb cash inflows from stations [73,74]. NIO intends to open its standard, engaging in dialogues with car makers [75], Startups like Aiways, offering battery-swap technology, could pose a threat, forming alliances with station manufacturers like BAIC.

**BMC FUTURE:** NIO takes the competition from fast chargers seriously. NIO's liquid-cooled cable-equipped columns are more powerful than Tesla's Supercharger V4 (500 kWh vs. 350 kWh) and are open to vehicles from other car makers. Battery-swap is just one pillar of NIO's business model, as 40% of its customers haven't used swap stations [76]. In the long term, battery-swap might lose



relevance as a fast charging tool but remains effective against vehicle obsolescence, allowing upgrades to newer batteries. NIO will focus on NIO-Power services, including columns, home solutions, and on-demand emergency charging. Opening swap station standards to other OEMs could create value for competitors' customers. Efforts are needed in the European market to establish NIO as a recognized premium brand, maintaining high quality standards even with increased production volumes. Continuous innovation and consolidating the customer experience will be crucial.

#### 3.4.3. BB Channels

**S:** The absence of intermediaries in new and used car sales, subscriptions, and aftersales services ensures high profit margins by avoiding third-party commissions on every transaction. The quality of the products is starting to be recognized by European media through various awards and positive journalistic reviews from publications in the Old Continent [77].

**W:** During expansion phases, the absence of partner channels prevents the company from immediately benefiting from an extensive existing network in the territory, capable of rapidly promoting the brand, and requires substantial investments in directly managed facilities such as NIO Houses. Some of these facilities have proven to be particularly costly, like the one in Shanghai, which incurs a monthly rent expense of \$240,000 alone, [78].

**O:** Analysts indicate that future market trends will involve a mixed reality characterized by physical touchpoints and digital channels, including online configuration and home deliveries. NIO enjoys several years of advantage over traditional premium OEMs who are recently migrating to this new model and must capitalize on this lead. The quality of customer service, ease of autonomous online operation, and overall product excellence must be maintained at an exceptional level to avoid detrimental impacts on the user experience of clients.

**T:** The NIO app effectively exploits its distinctiveness by functioning not only as a mere vehicle sales channel but also as a point of attraction and experience exchange among customers. However, it must consistently innovate to remain attractive and encourage customers to "consume" [79], responding to competitor strategies emphasizing emotional engagement. Over 90% of car buyers consulting social networks as part of the vehicle selection process believe they have been influenced by these platforms[80].

**BMC FUTURO:** NIO must find the right balance between the "user enterprise" strategy facilitated by NIO Houses and the cost sustainability of these establishments. Emphasis should be placed on NIO Spaces, which, while not providing the same type of experience, allows broader product exposure to a larger audience at a significantly lower cost. Simultaneously, continued investment in direct Service Centers in new territories is crucial to promptly meet the needs of new customers and generate additional revenues. The app's attractiveness must remain high, delivering an elevated experience while responding to competitors' app advancements. Marketing strategies should be tailored to new markets, leveraging local media to ensure the brand's distinctive elements are recognized and not confused with those of other Chinese OEMs.

#### 3.4.4. BB Customer Relationships

**S:** The relationship that NIO seeks to establish with its customers is profound, with the NIO app acting as the central hub. It has been previously analyzed how the NIO community is invited to provide direct feedback on the offered services, within a context that fosters collaborative innovation and member support. The community is also encouraged to promote the brand through the dual incentivization system of NIO credits and NIO points. The creation of the NIO life sub-brand, offering design and food products directly associated with the promoted lifestyle (modernity, sustainability, technology, style), serves the triple purpose of promoting the main product (the automobile), generating affiliation, and ensuring additional revenue. The app's over 200,000 daily accesses have led to a total of 8 million products sold since the brand's launch by the end of 2022, [81].

**W:** The high cost of acquiring new customers, primarily due to continuous investments for expansion into new markets, makes it imperative to maintain a "customer-first" culture: for NIO, it is

crucial to gain recognition while also retaining attracted customers. The development of Brand Identity (what the company wants to communicate about itself through its products and services, in this case, the perception of premium quality and reliability, and what sets it apart from other similar companies, in this case, advanced technology, community, and battery-swap services), Brand Image (the perception and feelings of customers towards a particular brand), and Brand Awareness (consumers' ability to place the company's products in a certain category and the tendency to re-consume products from familiar brands) are essential in a sector that is becoming increasingly crowded, and where the consumer's perception of purchasing risk for BEV products is still high due to current limitations in BEV technology, [7].

**O:** The previous data suggests the existence of significant room for improvement, especially considering NIO's achievements in the Asian market. In 2022, NIO ranks in the Top 200 most valuable brands in China [84], and tops the list of the most promising brands, not only in the automotive industry but the entire industrial sector of the country [82]. NIO must demonstrate the ability to achieve similar success in Europe. The vice president of NIO believes that the Western BEV market is still in pre-boom conditions and offers considerable growth potential, with a 25% share of the premium market at stake [83].

**T:** According to Porter's model, the bargaining power of buyers towards NIO is assumed to be high, given the servitization model adopted by the company. This model implies an easy termination of the customer-company relationship if customers perceive declines in quality, service issues, or simply no longer need the specific product, especially due to the availability of new goods in the market with more suitable features or prices. At the beginning of 2023, another factor, the price war initiated by Tesla in the Chinese market, led to a 14% price reduction for its models and substantial price erosion among most competitors, as shown in **Error! Reference source not found.** The price war showed signs of slowing down in China by June 2023 but began to extend to European and US markets. Furthermore, NIO faces the challenge of competitors like Geely and BMW responding to NIO life with their own structured offerings of branded lifestyle products [84].

**BMC FUTURO:** The factor of economies of scope becomes essential in a business model where differentiating the effort to meet the perceived satisfaction of customers from different segments is not allowed. While NIO's Brand Identity is already strong in China, Brand Image and Brand Awareness still need to be developed, primarily due to the company's youth, especially in the Western market where various Chinese-manufactured electric vehicles are often associated with each other in the mind of the typical consumer, if not entirely unknown. NIO's initial stance of not engaging in price wars and publicly declaring their unsustainability aligns with the brand image creation strategy pursued so far. However, there is a real risk of increasing the gap between NIO's prices and those of its competitors, leading to a loss of market share if this situation persists. In mid-2023, NIO reacted by removing a service that included a certain number of free battery swaps per month from its price list but stated that they would not introduce lower-priced configurations characterized by decontenting (removing certain vehicle features) that could reduce the premium perception of the product, [77,85].

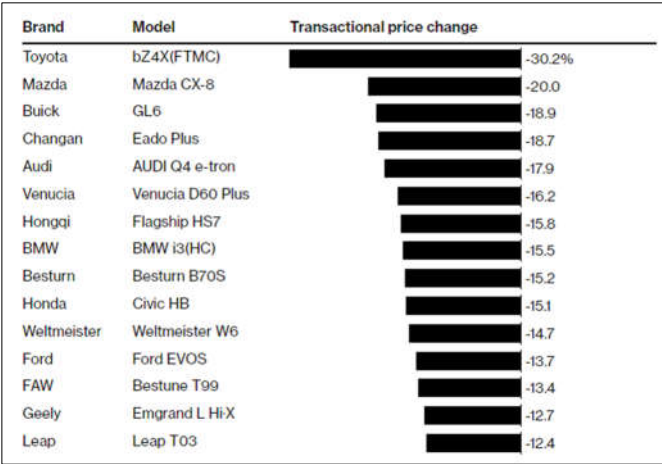


Figure 7. Price-war in China in Q1 2023 – models with the largest price drop. Source: Bloomberg [86].

3.4.5. BB Revenue Streams

**S:** The dual BaaS/direct sales model, offering many adaptable contractual alternatives to meet customer needs, allows for maximizing incoming flows; the company records revenues from car sales, offered at a lower price than competitors when sold without a battery; revenues from the sale of used vehicles, which depreciate less over time compared to other EVs with integrated non-removable batteries [87]; recurring revenues from battery leasing, usage of swap stations, and fast-charging columns; revenues from battery sales, possibly at a later stage after the vehicle purchase. With the launch of new, more powerful batteries, it is possible that customers may purchase more than one during the vehicle's useful life or choose a more expensive subscription to lease one with greater capacity. Batteries at the "end-of-life," no longer usable in vehicles (below 80% of their original capacity), can be resold for a second life in various applications, contributing to the company's commitment to the circular economy.

**W:** Between April and June 2023, NIO experienced a decline in deliveries, attributed by analysts to the period of model renewal (lower interest from potential customers in purchasing older products): during the quarter, the first deliveries of the EC7 models, the new generation of ES8, and especially the "all-new" version of the ES6 SUV, the best-selling vehicle of the automaker, began [88]. Q1 2023 revenues had already closed at \$1.56 billion, below analysts' and NIO's own expectations, marking the first decline after uninterrupted growth since March 2020 (see **Error! Reference source not found.**). NIO partly justified the negative performance with higher sales, in percentage terms, of the ET5 equipped with a 75kW battery pack, a model characterized by lower profitability among all. In 2022, the revenues from "automotive regulatory credits" also significantly decreased compared to the previous two years, resulting in a significant loss of remunerative flow for NIO [89].

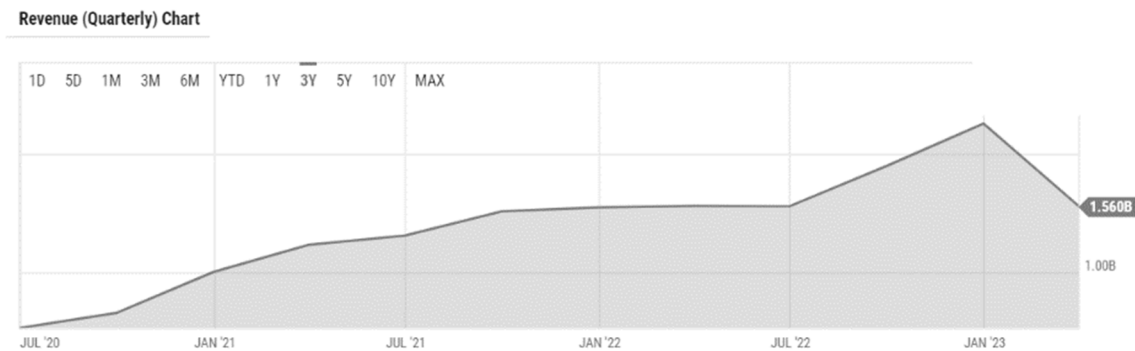


Figure 8. NIO quarterly revenue trend (USD) - source: YCharts [90].

**O:** Despite vehicle sales remaining the main revenue source (92% of the total), NIO has managed to increase revenues from accessory services, including repair, maintenance, and NIO Power, progressively capitalizing on investments in fast chargers and service centers [91]. These revenues surpassed half a billion dollars in 2022, mostly composed of NIO Power subscriptions (1.7% of the total) and additional services such as accessory sales, interest from financial services, and extended warranties. Revenues from battery upgrades have significantly decreased compared to the previous year; in this regard, the company must certainly better advertise the benefits of a battery upgrade, both in used car sales and in leasing, or create commercial proposals that incentivize upgrades. Undoubtedly, the launch of the new 150kW battery with a range of 1,000 km, scheduled for summer 2023, will represent an opportunity for gain. Another aspect that NIO is working on is the streamlining of supply flows [88].

**T:** The BEV market in China is showing the first signs of slowing down; after a substantial doubling of sales in 2021 and 2022 compared to previous years, a more modest +30% is expected for 2023. In the 2023 investor report, NIO explicitly mentions the slowdown of the Chinese economy as one of the potentially most significant threats to the company's future, along with the potential worsening of political-economic relations between China and the USA. Some CEOs of European OEMs are urging EU authorities to impose tariffs on imported Chinese cars, describing it as the only solution to maintain the manufacturing chain in the Old Continent, where costs are 40% higher than in China [92]. In mid-June 2023, sources close to the EU Commissioner for the Internal Market leaked information about an imminent opening of a dossier for the evaluation of such a proposal [93].

**FUTURE BMC:** In 2023, NIO is not yet profitable, as the authors will analyze in the Cost Structure BB and in the concluding chapter. Revenues related to accessory services, subscriptions, and merchandise are increasing, even in percentage terms on total revenues, but they are still not significant enough to significantly impact the operating result; these increased incoming flows have also been largely negatively offset by the reduction of environmental credit sales, which have high margins, and on which the company may rely less in the future. NIO must find a way to increase recurring revenues – based on some analyst estimates, it is possible to calculate that each vehicle sold generates about \$700 in annual recurring revenues, even though only 40% of consumers use BaaS [94]; for every half a million vehicles produced, there is the possibility of generating \$350 million in annual recurring revenues throughout the vehicle's lifespan, revenues that would increase proportionally if NIO manages to increase subscriptions. Responsiveness in adapting the business model to economic conditions remains essential. NIO's response to the price war of 2023 and the decline in sales was the decision, not without pain, to discontinue the service of unlimited free battery swaps for new customers, offset by a general reduction in prices ranging from 6% to 9%, a move positively judged by Deutsche Bank [95]. In this way, NIO will benefit from increased sales price attractiveness in exchange for higher recurring revenues during the vehicle's lifecycle (from \$12 to \$14 per swap, in addition to charging fees that NIO has declared to make more flexible, also with the creation of prepaid packages [96]).

#### 4. Discussion

The authors are now able to build the current Business Model Canvas in its complete form and integrate the changes that NIO will presumably need to implement in the future, based on the available information.

**Error! Reference source not found.** reconstructs NIO's Business Model Canvas by combining the nine identified Building Blocks from the previous chapter. Bold and crossed-out elements indicate the business model transformations that the company has already started or will undertake in the immediate future, based on the information available to date. This integrated representation of how the company captures, creates, and delivers economic value allows for a concise and dynamic visualization of the ongoing transformation of the business model paradigm of the company.



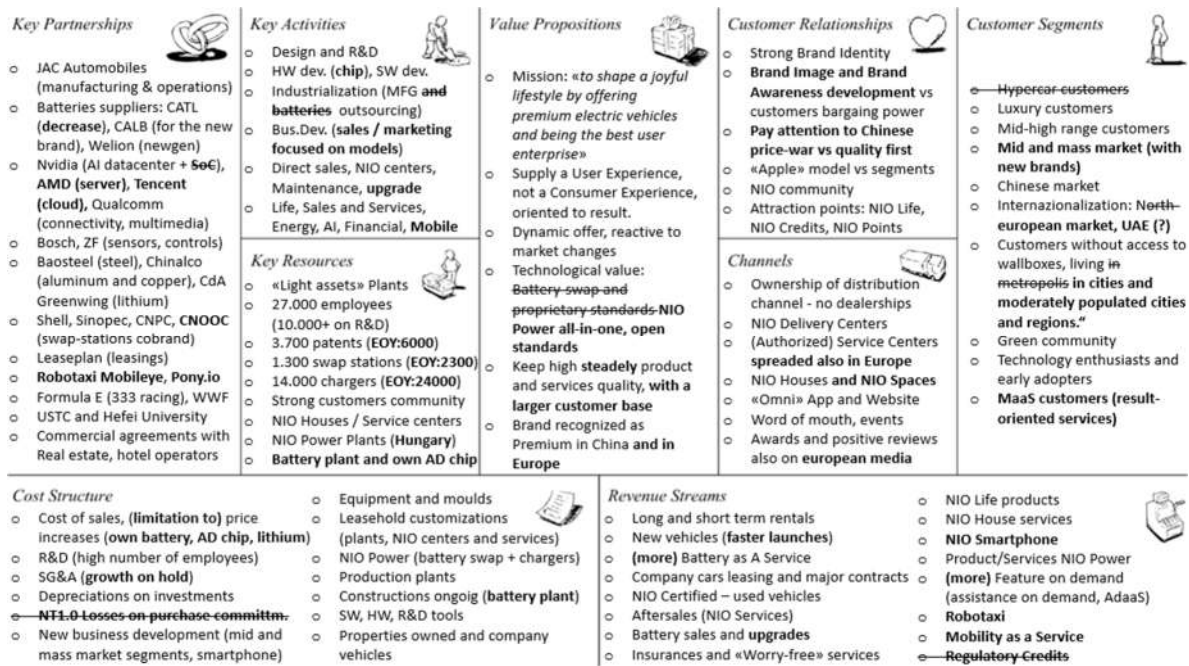


Figure 9. Business Model Canvas present and future of NIO.

Analyzing the BMC, it is evident the actions that NIO is beginning to undertake to counter the threats identified by Porter's model. The threat of substitute products has been addressed by orienting the future model not only towards battery-swap but also towards NIO Power fast charging services, offered to customers of third-party OEMs as well. In response to the threat of new entrants in the battery swap sector, NIO has reacted by opening its own standard to establish its supremacy and forming strategic alliances with leading companies in traditional service station management, crucial for accelerating the spread of swap stations and fast charging columns. The bargaining power of suppliers, typically low due to high competitiveness in the sector, is further controlled by NIO's strategy of vertical integration, strategic alliances, and raw material control.

On the other hand, the bargaining power of buyers, which is usually high in service-based businesses, is partially limited in NIO's case due to its unique technological offering within the reference price range, well-developed Brand Identity in China (strong connection between "NIO," "luxury," and "battery-swap"), and customer recognition of the high quality of products and services offered. In this context, community development and word-of-mouth, along with the NIO App, have proven to be successful strategies in China, serving as valid alternatives to traditional advertising. In the future, the company must focus on developing Brand Image and Brand Awareness to maintain its economic moat, with particular attention to Western markets.

NIO is managing to carve out uniqueness compared to numerous competitors in an increasingly crowded sector, implementing a precise differentiation strategy. Despite the recent decline in sales, in Q1 2023, NIO remains the most successful local electric vehicle manufacturer in China in the price range above 300,000 RMB (approximately 38,000 EUR) with a 55% market share, and in the range above 400,000 RMB (approximately 50,000 EUR) with a 76% market share [97]. The electrification of the premium market in China is progressing more slowly compared to other segments, which may be counterintuitive to a Western observer. The premium electric SUV market in 2023 represents only 12% of the market mix, a low value compared to the mass market where BEVs have reached a 21% market share [97]. Consequently, NIO has significant potential for growth in the general premium sector, which aims to materialize at the expense of European luxury OEMs, identified as the main competitors by the company's management.

NIO is aware that it needs to make extensive efforts and substantial investments in Europe, prioritizing the construction of swap stations, which are behind schedule as per initial plans [97], and promoting brand awareness in a market where, as discussed earlier, Chinese vehicles are not easily



recognizable to the average consumer. Moreover, like other carmakers in China, it can boast a manufacturing cost that is on average 20% lower than that of European OEMs [98]. The impending aggressive entry of NIO into the mid and mass markets using dedicated brands can benefit from economies of scale, the already established charging infrastructure, and renewed government incentives for electric vehicle purchases in China and most European countries (though in more limited forms than in previous years).

In recent years, NIO has demonstrated the capability to rapidly adapt prices and service offerings, dynamically responding to changing market conditions. It has swiftly expanded the various combinations of BaaS, sales, leasing, rental, and after-sales services available in its regional sales areas. In the imminent future, NIO will capitalize on new products based on the NT 2.0 technological architecture, which will feature a new range of on-demand or subscription-based features such as various levels of Adas as a Service. These features have the potential to generate periodic forms of remuneration. Additionally, NIO will introduce supplementary products like higher-capacity next-generation batteries, smartphones with personalized services for in-car use, advanced customization in after-sales services, and a growing number of NIO Life accessories.

Looking into the medium to long term, the BMC highlights the need to make all MaaS (Mobility-as-a-Service) activities profitable, which are still in their embryonic stage, where the company is involved as a partner providing autonomous driving services or vehicles equipped with advanced hardware. The substantial investments in direct control of raw materials, internal chip design, and battery production will eventually lead to significant reductions in the cost of goods sold. However, due to a dangerous decline in gross margins observed in recent quarters (refer to **Error! Reference source not found.**), NIO had to postpone its break-even expectations initially set for 2024 [99]. The liquidity issue that NIO may have to address in the near term arises not only from the decline in sales of first-generation technological architecture vehicles but also from the multiplicity and heterogeneity of investments that management has undertaken in parallel to reduce future variable costs and secure a lasting competitive advantage.

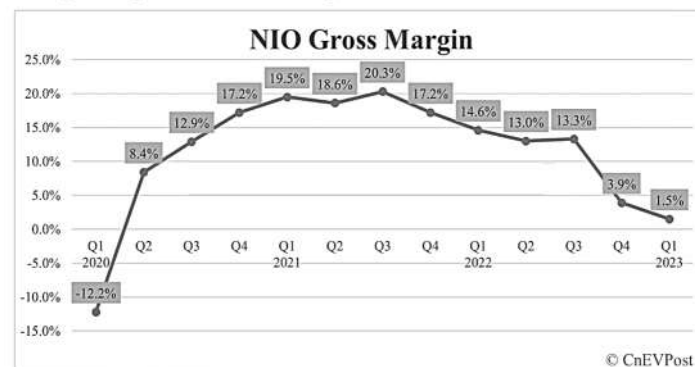


Figure 10. NIO: Gross margin trend. Source: CnEVPost [91].

The CEO of Li Auto, an emerging OEM specialized in marketing lower-tier hybrid and electric vehicles compared to NIO and a potential direct future competitor, emphasized that a healthy and sustainable automotive company should target a product gross margin of 15-25%, as demonstrated by BYD and Tesla [96]. NIO will need to continue dynamically adjusting its pricing strategy to increase sales and revenue. Towards the end of June 2023, the ongoing price war in China that started at the beginning of the year appears to have experienced a first slowdown, with several Chinese carmakers no longer offering the discounts that were in effect over the previous six months. Just a few weeks earlier [100], NIO had decided to unbundle the BaaS service package from the base price to enhance competitiveness. Therefore, NIO must be capable of seizing the opportunity presented by the renewed market conditions.

The financial consulting firm Alixpartners observes that "technology control, government support, cost competitiveness, and business models that respond better and faster to market demands are the combination underlying the success of Chinese OEMs" [101], and NIO does not seem to be an

exception. Analysts from the Japanese investment bank Mizuho Securities stated in a note in June that: "Despite short-term difficulties, we believe NIO remains well-positioned thanks to several imminent projects, including the lower-cost ES6 SUV [...], a leadership position in the Chinese premium electric vehicle market [...], expansion into Europe and the global market, and a continuously evolving product range" [102]. The liquidity injection from the Abu Dhabi fund, along with cost stabilization efforts for SG&A (Selling, General, and Administrative) expenses and the postponement of several previously planned capital investments to 2024, should allow the company to mitigate these challenges. Moreover, it offers a privileged position in a potentially strategic and luxury-oriented new market, the Arabian Peninsula.

## 5. Conclusions

In conclusion, it is possible to summarize the activities carried out in this study as the development of an approach for analyzing, synthesizing, and forecasting the future of a business model, applied to a real case in the automotive industry. Five main results can be identified:

- An integrated methodology for representing the company's business model, showing its evolution synthetically, by combining the use of PEST analysis (including Porter's competitive forces model for Threats), SWOT matrices, and the Business Model Canvas, has been described.
- PEST analysis applied to the automotive industry, considering the most recent conditions of the global market, with a specific focus on the battery electric vehicle (BEV) sector, has been performed.
- The ongoing process of servitization in the automotive industry has been described, following a simplified form of Gaiardelli's Product-Service Systems classification, with particular attention to new trends in service-oriented models.
- The case study of the Chinese electric vehicle manufacturer NIO has been presented, detailing the innovative elements of the product offering, brand strategy, and the company's applied business model.
- Using the tools described in points (a), (b), and (c) and based on publicly available information, the current Business Model Canvas of NIO has been deduced, and its probable future transformation has been hypothesized and discussed.

Regarding possible practical implications of this work, the aim was to develop a more structured methodology compared to one defined by the exclusive use of the BMC tool. This technique has the benefit of guiding the user in the detailed analysis of inputs and the formulation of appropriate questions before proceeding to construct each Building Block. The final result allows for maintaining a holistic and immediate view of the present structure and the potential future transformations of the business model of the studied company. The practical application of this methodology to the BEV sector was conducted in detail by presenting a real case study, aiming to provide a real qualitative view of an innovative startup considering its technology and commercial strategy, but at a potentially critical point in its evolution.

As for possible future developments, it could be useful to readapt the methodology applied to forecast a variety of alternative future scenarios for the model itself, considering variations in the external environment of the company. The BMC model could explicitly capture the most significant interactions between the Building Blocks and external factors (possibly in a graphical manner, as suggested by Osterwalder and Pigneur), analyze their variations after applying a defined set of inputs, and formulate alternative future evolutions of the model based on the intensity and types of external factors applied, generally related to a combination of PEST scenarios.

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