5-2022

NIO's Battery-as-a-Service strategy

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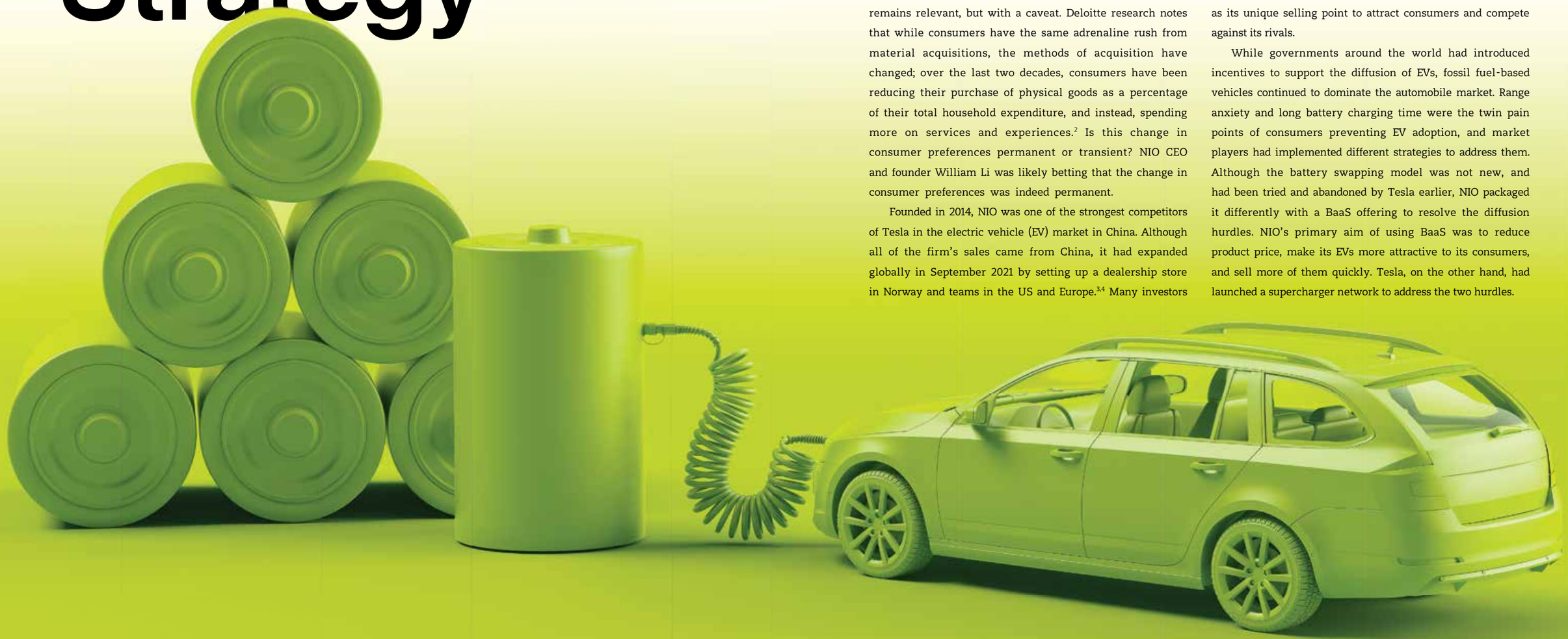
A game changer in the EV industry?

by Shantanu Bhattacharya and Lipika Bhattacharya

"Buying is a profound pleasure" commented Simone de Beauvoir, the noted existentialist author, on the salutary effects of material acquisitions on the human psyche.[1] While these words were spoken more than half a century ago, the impact of acquisitions on consumer utility remains relevant, but with a caveat. Deloitte research notes that while consumers have the same adrenaline rush from material acquisitions, the methods of acquisition have changed; over the last two decades, consumers have been reducing their purchase of physical goods as a percentage of their total household expenditure, and instead, spending more on services and experiences.[2] Is this change in consumer preferences permanent or transient? NIO CEO and founder William Li was likely betting that the change in consumer preferences was indeed permanent.

Founded in 2014, NIO was one of the strongest competitors of Tesla in the electric vehicle (EV) market in China. Although all of the firm's sales came from China, it had expanded globally in September 2021 by setting up a dealership store in Norway and teams in the US and Europe.[3,4] Many investors and stock analysts in the market were closely watching NIO to see if it could mirror the path Tesla had taken to become a strong global competitor. Although Tesla was the clear leader across all markets in the EV sector, the competition was intense and NIO had launched battery-as-a-service (BaaS) as its unique selling point to attract consumers and compete against its rivals.

While governments around the world had introduced incentives to support the diffusion of EVs, fossil fuel-based vehicles continued to dominate the automobile market. Range anxiety and long battery charging time were the twin pain points of consumers preventing EV adoption, and market players had implemented different strategies to address them. Although the battery swapping model was not new, and had been tried and abandoned by Tesla earlier, NIO packaged it differently with a BaaS offering to resolve the diffusion hurdles. NIO's primary aim of using BaaS was to reduce product price, make its EVs more attractive to its consumers, and sell more of them quickly. Tesla, on the other hand, had launched a supercharger network to address the two hurdles.



Despite its promise, NIO's BaaS strategy entailed a few shortcomings. Battery swapping was an expensive model, as it involved the construction of swapping stations, deployment of automated technology, maintenance of battery stocks, and collection of batteries at stations. Besides, battery technology had started to advance and batteries could last longer in terms of distance travelled based on a single charge, reducing the need for frequent recharging at swapping stations. Given this scenario, was NIO's BaaS venture a sustainable business model? Could it provide NIO with a strong competitive advantage?

DIFFUSION OF THE EV

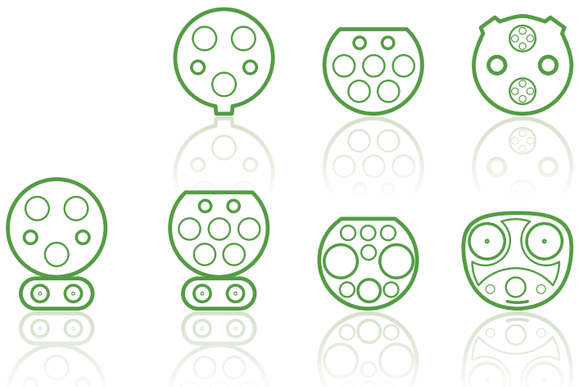
While EVs had been around for decades, it was only in the early 2000s that governments and automakers started promoting them as a key technology to curb oil use and fight climate change.[5] Subsequently, demand for EVs started to grow, and research reports predicted that the sale of EVs would overtake the sale of fossil fuel-based cars by 2035.[6] Governments had started to increasingly promote EVs through subsidies, fuel taxes, and tighter environmental regulations. At the same time, the unit cost of manufacturing EVs and batteries was expected to fall significantly by 2027 due to advancements in technology.[7]

Despite the advancements, the diffusion of EVs had been persistently slow. The consensus was that this was due to the twin hurdles of range anxiety and long battery charging time. Without them, EVs would have been jostling for pole position much earlier. The significance of these hurdles was easier to understand by delving into the consumer psyche. For example, if consumers went for a long drive and were not sure that they could reach the next charging station with their current charge, they would be hesitant to adopt EVs. Similarly, if battery recharging took a long time, it could significantly lower the utility from the journey. Hence, the need to alleviate these two hurdles using a mix of technologies and new business models was imperative for EVs to become the dominant mode of transportation in the future.[8]

Assessing the diffusion of fossil fuel-based vehicles helps throw more light on some additional factors. Fossil fuel-based vehicles faced slow adoption in the beginning as the complementary infrastructure, such as refuelling stations, the highway network, rest stations, restaurants, and facilities, took a long time to develop. Once the complementary infrastructure was in place, the diffusion of fossil fuel-based vehicles began to burgeon.

To tackle the EV diffusion problem, firms like Tesla and Better Place had also experimented with the battery swapping model. While Tesla had made significant inroads into the Chinese market, its primary market was still the US, where the lack of customer density meant that Tesla needed to set up a very large number of stations for customers to have easy access to battery swapping. The cost versus revenue possibilities from the battery swapping model for its key market had motivated Tesla to drop the strategy (Better Place too discarded this model eventually). In 2019, Tesla introduced Tesla V3 superchargers, which were much cheaper to install than battery swapping stations, to counter the battery charging time and range anxiety problem: the superchargers could reduce the battery charging time to under two hours, and a dense supercharger network could also alleviate the range anxiety problem.[9]

NIO started offering subscription plans for its batteries in early 2020, enabling consumers to buy its vehicles without the battery.



PRICE COMPARISON OF NIO MODELS WITH BAAS

NIO Model	ES8 (7-seater SUV)	EC6 (5-seater SUV)	ES6 (5-seater SUV)
Battery Specifications	70-100kWh	70-100kWh	70-100kWh
Manufacturer's Suggested Retail Price (MSRP)	US$73,389 to US$82,484	US$57,736 to US$66,836	US$56,167 to US$65,267
Post-Subsidy Price	US$70,884 to US$79,701	US$55,194 to US$64,012	US$53,626 to US$62,443
Price with BaaS	US$59,901 to US$59,619	US$44,212 to US$43,930	US$42,643 to US$42,361

TABLE 1 Source: NIO

NIO'S BAAS STRATEGY

NIO realised early in its business that batteries could add significant costs to EVs, which were competing against traditional fuel-run cars in the market. Removing the cost of the battery from the product and making it more affordable, accessible, and reusable was also necessary for realising the Chinese government's ambition of controlling pollution from fuel-based vehicles by having one in five vehicles powered by non-fossil/non-fuels by 2025.[10] To this end, China launched a support scheme for EV manufacturing companies in 2020 to promote the setting up of swapping stations to lure more consumers to buy EVs.[11]

Although NIO had home charging solutions for its batteries, very few homes in China had the infrastructure to support the installation of home charging points, as the majority of its EV consumers were from large cities and lived in high-rise condominiums. The infrastructure considerations, diffusion hurdles, government support schemes, and price challenge had acted as key motivations for NIO to establish its swapping station network and offer BaaS services.[12]

NIO started offering subscription plans for its batteries in early 2020, enabling consumers to buy its vehicles without the battery. Removing the battery reduced the purchase price of NIO vehicles by US$10,834.[13] Under the subscription plan, buyers paid a monthly fee of US$152 to lease a battery and could use free charging and swapping services as part of the subscription.[14] By 2021, NIO had executed more than two million swaps, and converted almost 40 percent of its consumer base to BaaS.[15]

The BaaS services were offered through a mobile-based solution that connected the entire network of battery swapping facilities. The swapping process was fully automatic: the car was driven into the station where it would be serviced by a car lift battery replacement system that replaced the batteries automatically. A cloud-based battery management system inspected every battery pack removed from a vehicle for electrical performance before recharging it for the next user. If a fault was identified, the battery would be taken out of circulation and sent for repairs.[16] In terms of footprint, NIO swapping stations were as large as three parking spaces, making them convenient to install in parking facilities and even crowded public places.[17] By 2021, NIO had installed 301 battery swapping stations across China, with plans to expand to 3,000 swapping stations globally by 2025.

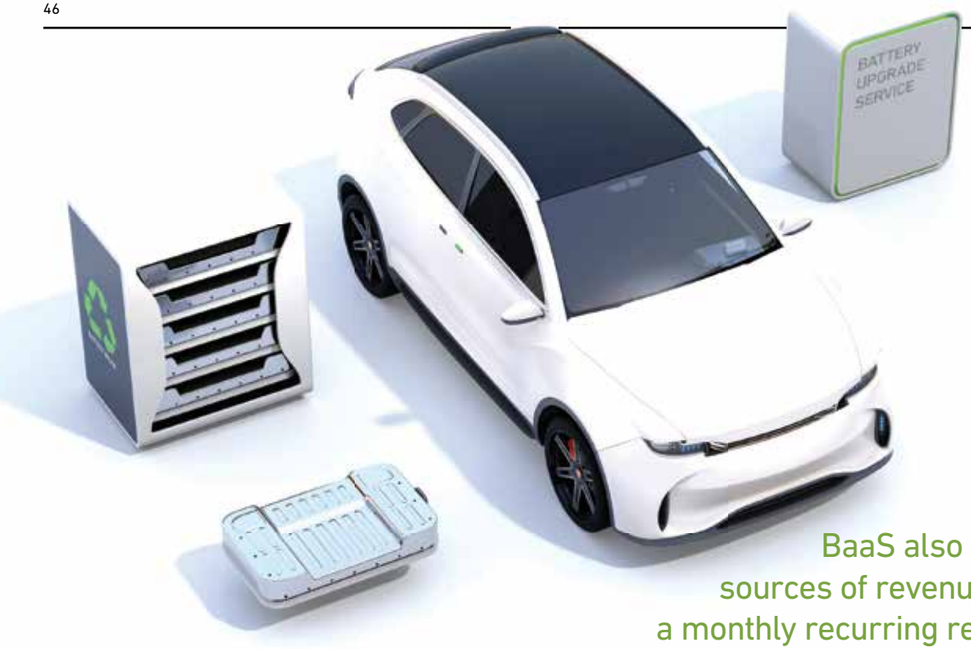
BENEFITS OF NIO'S BAAS SERVICE

NIO's bet on BaaS hinged on several key factors and accorded merit in terms of feasibility, profitability, and growth prospects for the company. Firstly, the battery swaps at the stations were fast. On average, it took three to five minutes to replace the existing battery in the vehicle with a fully charged battery, compared to 75 minutes for a full charge at a supercharger.[18]

Secondly, the battery swaps were also slightly cheaper than other battery alternatives for EVs. NIO's service offered six swaps a month for its monthly subscription price, which provided about 1,500 miles of range. This amounted to US$0.10 per mile, which was slightly lower than the estimated US$0.104 per mile cost for using Tesla superchargers.[19]

Thirdly, swapping batteries also motivated NIO customers to opt for battery upgrades when a more advanced battery pack was available, which helped preserve the car's performance and resale value, and mitigated broader concerns of battery degradation. To ensure that new batteries could fit with old cars, NIO standardised its battery sizes, thereby enabling its batteries to become a replaceable module in the broader construction of the vehicle.

Fourthly, batteries were an important consideration in the EV market; the market dominance of an EV producer was correlated with who could build the best battery technology. NIO's BaaS helped in this respect by allowing the company to invest in battery technology without worrying about replacing older batteries.



BaaS also created two sources of revenue–one from a monthly recurring revenue from battery service subscriptions, and the other from upgrade requests for newly launched batteries.

In terms of feasibility, NIO's BaaS strategy reduced the high capital outlay for batteries for its consumers by reducing the price of the vehicle by a significant amount, and at the same time, helped build a close relationship between the brand and its consumers.[20] In terms of profitability, the BaaS model could potentially enable higher sales due to the reduced price. BaaS also created two sources of revenue–one from a monthly recurring revenue from battery service subscriptions, and the other from upgrade requests for newly launched batteries.[21] With approximately 75,500 NIO EVs on the road as of 2021, analysts estimated that the subscription service generated about US$4.5 million in monthly recurring revenue or US$54 million in annual revenue. This revenue was expected to increase further as NIO expanded production, increased subscription penetration among existing consumers, multiplied sales, and grew its network of swap stations.[22]

EV AND THE CIRCULAR ECONOMY: THE BATTERY CONSIDERATION

EV sales had increased from 17,000 in 2010 to 2.1 million by 2019 (with China accounting for 47 percent of global sales), and the global EV market was expected to grow to 125 million vehicles by 2030.[23] Many traditional auto manufacturers had started to focus purely on EV models and halt traditional car manufacturing for the future. For example, General Motors had set a target to stop selling new gasoline-powered cars and light trucks by 2035; Volvo had decided to pivot to a hybrid and all-electric line-up by 2030.[24,25]

However, while EVs were expected to alleviate pollution from fossil-based transport, many materials used in the batteries were toxic and rare.[26] In addition, 250,000 metric tons of EV lithium-ion batteries were expected to reach their end-of-life use by 2025.[27] Despite being non-usable for vehicles, these batteries could still retain 70 to 80 percent capacity and potentially be used for other purposes. Finding a second life for disposed batteries was essential to making EVs sustainable, slowing down the resource cycle and improving EVs' contribution to the circular economy.[28] Capturing the value left in a product after use was the cornerstone of the circular economy.[29]

When a battery was offered as-a-service by the manufacturer–NIO in this case–the ownership of the battery was transferred to NIO. By owning the battery, NIO could have 100-percent collection rates of the batteries, assess their quality and disposal effectively, and allow customers to upgrade to new batteries of the next generation seamlessly. Therefore, the BaaS model was seen as a viable strategy to facilitate the circular economy.[30]

COULD BAAS REALLY BECOME THE GAME CHANGER?

However, not all analysts believed BaaS to be beneficial. Some opined that while NIO's BaaS and large-scale implementation of swapping stations could provide the company with immediate advantages in the market, it was unlikely to provide much competitive advantage in the long run.[31] This was primarily because battery technology was evolving rapidly and charging times were predicted to reduce dramatically in the near future.[32]

EVs with lithium-ion batteries were expected to give way to vehicles with lithium-iron phosphate batteries and other technologies that could cut costs, extend vehicle ranges to 400 miles or more between charges, and enable batteries to last for as long as a million miles.[33] Moreover, new EV technology could make electric vehicles as cheap as those powered by petrol, and the EV price would no longer pose a cost barrier.[34] On a separate note, analysts had also raised concerns over NIO's battery swapping strategies, arguing that setting up battery swapping infrastructure and swapping stations was expensive, hence they had to fulfil the long-term needs of consumers to make business sense.[35] However, with battery technology advancing so quickly, it seemed unlikely that swapping stations would remain relevant over the long time horizon.[36]

Amidst such strategic concerns, would it make more sense for NIO to halt its battery swapping infrastructure and focus on the battery technology itself? Alternatively, could NIO continue to benefit from its BaaS services, and make them its winning strategy? AMI

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