

Review Article

Cost Analysis of NIO Inc.

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Founded in 2014, NIO is a Chinese smart electric vehicle company, sometimes called Chinese Tesla. In the face of the scarcity of research on NIO, this paper analyzes and evaluates NIO's business management decisions following the six steps: Step 1 explores NIO's value chain; step 2 discusses costing methods suitable for NIO; step 3 classifies NIO's costs into variable, fixed, or mixed costs; step 4 conducts cost volume profit analysis for ES8; step 5 analyzes the impacts of NIO's sustainable practices on its budgeting; step 6 discusses KPIs NIO might use to evaluate its business performance. Materials used in this paper include NIO's 2021 annual report, NIO's websites, and other secondary sources, such as online articles.

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1. Introduction

1.1. Summary of NIO

NIO is a Chinese car company designing, developing, manufacturing, and developing luxury smart electric vehicles equipped with next-generation technologies, such as cutting-edge batteries, autonomous driving, and digital technologies (NIO, n.d.-b). Founded in 2014 by Bin Li, NIO aims to create a joyful life based on its core philosophy, "Blue Sky Coming" (NIO n.d.-a; NIO n.d.-b). This philosophy guides NIO to create a better and sustainable future with users and technological advancement and is also included in NIO's logo (NIO n.d.-a). This philosophy may be influenced by Bin Li's life and personality. Born in a relatively low-income family, he acquired business experience early in his life by doing part-time jobs and by helping his grandparents' job and learned the importance of setting not short-term but long-term business goals (Smith, 2022). In addition, his sociable and convincing personality allowed him to have a rich network, which led to the foundation and success of his former businesses as well as NIO

(Smith, 2022). His future-driven philosophy and his personality may be reflected in NIO's proactive and inclusive philosophy.

Since its foundation in 2014, NIO has undergone some key events. In 2016, NIO developed a powerful, stylish, and quality electric sports car called EP9, which enhanced its reputation as a luxury smart electric car company (ZIPPIA, n.d.). In addition, NIO was approved to test its autonomous vehicle by the California DMV, which raised more than US\$1 billion from investors (Smith, 2022). In 2017, NIO completed its infrastructure to manufacture production cars and introduced its first production car, ES8 (NIO 2022a; ZIPPIA, n.d.). In 2018, NIO started deliveries in the summer (ZIPPIA, n.d.) and collected US\$1.8 billion from IPO on NYSE (Smith, 2022). However, some of the ES8, one of the car models, fired up because of plug jacket problems, which damaged NIO's brand image and made it necessary for NIO to recall all the cars it had produced in early 2019 (ZIPPIA, n.d.). In addition, NIO started delivering an SUV model called ES6, equipped with improved battery technology, which made NIO one of the nearest rivals for TESLA (ZIPPIA, n.d.). In 2020, NIO launched a new electric coupe SUV called EC6 (NIO, 2020c). Despite the negative impacts of COVID-19, NIO's sales have grown steadily in 2020 (Smith, 2022). In January 2021, "NIO launched its first autonomous driving model, NIO ET7, a smart electric flagship sedan" (NIO, 2021b, para. 1). In December 2021, NIO also introduced a new smart electric sedan named ET5 (NIO, 2021a). In 2022, NIO introduced a new model called ES7 (NIO, 2022b). ES7 is a smart electric SUV that is equipped with new technologies and runs long distances (NIO, 2022b). As of January 20, 2023, NIO's market capitalization is US\$ 18.19 billion (The Wall Street Journal, n.d.).

1.2. Overview of Industry

The electric vehicle market is a developing market and still has significant growth potential. In 2021, only 9% of total passenger car sales were accounted for by electric vehicles, including fully electric cars and hybrid cars, with 6.5 million unit sales (Canalys, 2022). Mainland China and Europe consumers dominate this market by accounting for 50% and 35% of worldwide electric cars sold, respectively (Canalys, 2022). The top three electric vehicle companies are Tesla, Volkswagen Group, and SAIC, and they represent 14%, 12%, and 11% of the market, respectively (Canalys, 2022). In relation to the electric vehicle market, Liu (2022) predicts the growth of other related markets, including the used electric vehicle market, the maintenance and services market, the electric vehicle accessories market, the insurance market, the charging service market, and the video streaming market.

1.3. Objectives, Materials, and Methodology

To the best of my knowledge, there are a few research papers focused on NIO (Oliveira, 2022; Pocinho, 2022). To deal with this scarcity, this paper aims to analyze NIO's management decisions using secondary information available on its financial statement, its website, and other secondary sources, such as online articles. This paper develops based on the following six steps:

- Step 1 – Cost Classification of NIO: This step explores six functions of the value chain (i.e., research and development, design, production or purchases, marketing, distribution, and customer service). This step also identifies and classifies different types of costs, including product costs, period costs, direct material, direct labor, indirect materials, indirect labor, and other indirect manufacturing costs.
- Step 2 – Costing System of NIO: Although the initial purpose of this section was to investigate the costing system that NIO actually uses, I could not find NIO's costing system information. Therefore, this section discusses the characteristics of three costing methods: process costing, job costing, and activity-based costing. Then this section discusses which costing method is appropriate for NIO and how NIO might use the costing method.
- Step 3 – Cost Behavior of NIO: This step classifies various costs of NIO into either fixed, variable, or mixed costs and the possible cost drivers based on the author's knowledge and NIO's annual report (i.e., NIO, 2022a).
- Step 4 – Cost Volume Profit Analysis of ES8: Although NIO produces different car models, this step focuses on a specific model, ES8, to conduct the cost volume profit analysis. This is because ES8 is NIO's first production model introduced in 2017 (ZIPPIA, n.d.). Firstly, this step explores the characteristics, target customer, price, and yearly unit of sales of ES8. Then, this step analyzes the break-even point of ES8.
- Step 5 – NIO's Environmental Sustainability Practices and Budgeting: This step analyzes the impacts of NIO's sustainable practices on its budgeting.
- Step 6 – Performance Evaluation: This step explains what kinds of key performance indicators NIO might use to evaluate its business performance.

2. Analysis of NIO

2.1. Step 1 – Cost Classification of NIO

2.1.1. Value Chain of NIO

Although the main purpose of this step is to identify and classify different types of costs, to achieve the purpose, it is essential to understand the business activities of NIO. Therefore, this step begins with the analysis of NIO's value chain. According to Braun and Tietz (2018), the value chain is "the activities that add value to the company's products and services" (p. 51) and comprised of six activities: research & development (R&D), design, production or purchases, marketing, distribution, and customer service. R&D is the activity of developing, improving, and producing goods or services (Braun & Tietz, 2018). Design is the activity of engineering and producing goods and services and planning their production processes (Braun & Tietz, 2018). Production or purchase is the activity of manufacturers producing goods by using resources (e.g., raw materials, direct labor, and manufacturing overhead) or purchasing inventories from manufacturers for resale (Braun & Tietz, 2018). Marketing is the activity of enhancing customer demand by promoting and advertising goods and services (Braun & Tietz, 2018). Distribution is the activity of delivering goods and services with brick-and-mortar stores, websites, shipping, catalog sales, door-to-door selling, or a combination of them (Braun & Tietz, 2018). Customer service is the activity of providing customers with services after the sale (Braun & Tietz, 2018).

In order to keep up with the industry's fast technological improvement and to meet customers' needs and wants, NIO actively engages in R&D (NIO, 2022a). For example, NIO tries to enhance vehicles' interactiveness, immersion, and comfort by developing and integrating its technologies, including battery, software, hardware, autonomous driving technologies, electric powertrain, and digital technologies (NIO, 2022a). In fact, R&D expenses in 2020 increased by 84.6% from the previous year and reached about US\$ 720.6 million (NIO, 2022a). NIO (2022a) plans to continue investing a significant amount of money in R&D.

Since NIO is a manufacturing company, it goes without saying that it engages in design activities. NIO (2022a) considers design and styling to be primary competitive factors in the automotive market. NIO designs not only vehicles but also the brand, user experiences, and other products, considering the following factors: software technologies, aerodynamics, thermal management, handling, and comfort (NIO, 2022a). For example, NIO's software technology called 4D Dynamics collects road data to enhance

driving comfort by adjusting vehicle actuators (NIO, 2022a). In addition, NIO (2022a) takes sustainability into account when it designs vehicles. This is reasonable because design determines 90% of the sustainability of products (Braun & Tietz, 2018). NIO tries to design and develop environmentally friendly vehicles by using sustainable materials, assessing the carbon emission of the product lifecycle, and designing eco-friendly production processes (NIO, 2022a).

NIO conducts marketing activities, but there are similarities and differences in marketing strategies between NIO and other traditional automotive companies. Like traditional automotive companies, NIO has its official Twitter, Instagram, Facebook, LinkedIn, and Youtube accounts and posts videos with some messages. In addition, NIO sponsors NIO 333, a Formula E team that participated in the FIA Formula E World Championship (NIO, 2022a). Although NIO also invests money in advertising and promotion activities like traditional automotive companies (NIO, 2022a), it puts more effort into big events and user referrals (Guan & Zhou, 2022). Since NIO does not produce as many cars as traditional automotive companies, it is difficult for NIO to shoot a TV commercial which significantly increases the marketing cost per car (Guan & Zhou, 2022). Instead, NIO focuses on two marketing strategies: (1) improving referral and conversion rates with high customer satisfaction and events; (2) hosting a big and impactful event, such as NIO Day (Guan & Zhou, 2022). These two marketing strategies help NIO to save on marketing costs (Guan & Zhou, 2022).

Although the information on the distribution function of NIO was limited, I found that NIO took orders on the NIO App (NIO, 2022a) and at a big event, NIO Day (Guan & Zhou, 2022). In addition, as of the end of 2021, NIO has 37 NIO Houses and 321 NIO Spaces that function as showrooms. The website says that cars can be picked up by users at distribution centers or delivered to them (NIO, n.d.-c).

NIO puts much more effort into service activities than any other automotive company. Although the relationship between traditional automotive companies and final consumers is weak, NIO adds value to its products by developing long-term customer relationships, and it positions itself as a premium smart electric car brand (Guan & Zhou, 2022). For example, NIO develops its user community by using NIO App, NIO Events, and NIO House (NIO, 2022a). NIO House has a dual function of a showroom and clubhouse for the community, and there are 37 NIO Houses (NIO, 2022a). In addition, NIO provides customers with comprehensive energy support with Power Home, Power Swap, Power Charger, Power Mobile, Power Map, and One Click for Power (NIO, 2022a). Power Home is NIO's activity of installing standard and high-speed smart home chargers at customers' homes (NIO, 2022a). Power Swap is NIO's activity of quickly swapping batteries of users' cars at swap stations (NIO, 2022a). Power Charger is NIO's activity of

allowing users to charge their cars at some locations (NIO, 2022a). As of the end of 2021, NIO has 3404 Power Chargers (NIO, 2022a). Power Mobile is NIO's activity of delivering and charging energy using 318 vans (NIO, 2022a). Power Map permits users to check the availability of both NIO chargers and public chargers (NIO, 2022a). One Click for Power is NIO's activity of picking and charging or swapping batteries of users' vehicles (NIO, 2022a). Furthermore, NIO repairs and maintains users' cars through NIO service centers, authorized service centers, and 220 service vans that supplement the service network (NIO, 2022a). NIO's service also includes insurance, routine maintenance, roadside assistance, and so on (NIO, 2022a).

Needless to say, NIO engages in production activities. Costs incurred in the production activities include direct material, direct labor, and manufacturing overhead which consists of indirect material, indirect labor, and other indirect manufacturing costs (Braun & Tietz, 2018). Although the next section does not explore costs in other value chain activities because they are consolidated as period costs (Braun & Tietz, 2018), the next section looks at the product (production) costs in detail to subdivide them.

2.1.2. Product Costs

In 2021, NIO's cost of vehicle and other sales increased by 103.8% from the previous year and reached about US\$4,600 million (NIO, 2022a). NIO (2022a) states that the "cost of vehicle revenue includes parts, materials, processing fee, compensation to JAC, labor costs, manufacturing overhead (including depreciation of assets associated with the production), and reserves for estimated warranty expenses" (F-24).

Since the definition of direct material is "the *primary* materials that become a physical part of the finished product" (Braun & Tietz, 2018, p. 60), for NIO, direct materials should include parts and materials. Similar to traditional automotive companies, NIO's direct materials might include engines, tires, seats, airbags, steel, and so on. In addition, they might also include NIO's unique parts, such as parts relating to AI and self-driving technologies and state-of-the-art batteries (NIO, 2022a).

NIO's labor costs should be included as direct labor because the definition of direct labor is the expenditures (wage and benefits) on employees creating products from raw materials (Braun & Tietz, 2018). Employee benefits include medical care, pension benefits, housing funds, and so on (NIO, 2022a).

Other costs which are not classified as direct material or direct labor should be regarded as manufacturing overhead (Braun & Tietz, 2018). However, there are three subclassifications of manufacturing overhead: indirect material, indirect labor, and other indirect manufacturing costs (Braun

& Tietz, 2018). Although the direct quote from the financial report does not specifically state indirect materials and labor, it is reasonable to assume their existence (e.g., indirect materials: cleaning supplies, machine lubricants, protective equipment; indirect labor: wages and benefits of security officers, accountants, and supervisors). The last classification – other indirect manufacturing costs – should include processing fees, compensation to JAC, depreciation of assets, and so on. Figure 1 summarizes the findings of step 1.

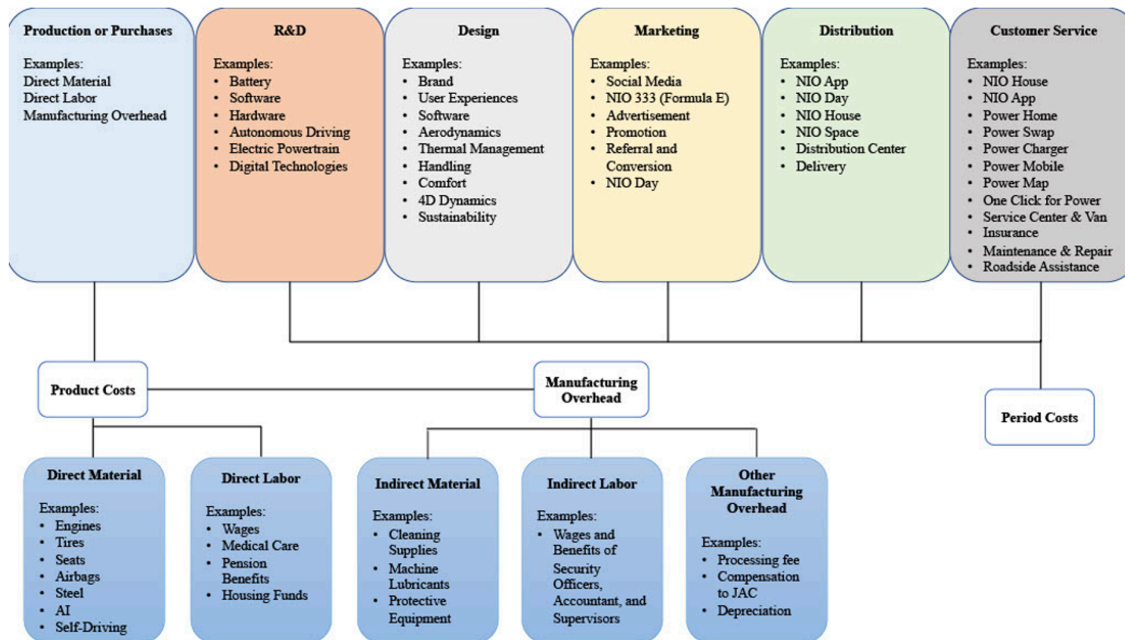


Figure 1. The Visual Representation of Step 1 – Cost Classification of NIO

Note. This figure summarizes the previous paragraphs and represents the value chain and the cost classification of NIO.

2.2. Step 2 – Costing System of NIO

Although the initial purpose of this section was to investigate the costing system that NIO uses, I could not find NIO's costing system information. Therefore, this section compares the characteristics of the three costing systems (i.e., process costing, job costing, and activity-based costing). Then, this section explores which or what combination of costing systems NIO might use based on its operating characteristics.

2.2.1. Characteristics of Process, Job, and Activity-Based Costing

Process costing is a costing method in which the movement and accumulation of direct and indirect costs follow the order of a production process and are transferred from the initial, middle, and last work-in-process inventory process to the finished goods inventory in order (Braun & Tietz, 2018). The information on direct material and labor costs is derived from material requisitions and labor time records; and manufacturing overhead costs are allocated with one of three methods: activity-based costing, plantwide rate, or departmental rate (Braun & Tietz, 2018). Process costing is used by companies that produce large quantities of identical products, such as oil and candies (Braun & Tietz, 2018).

Job costing is a costing method that tracks different direct and indirect costs of a small number of different products (Braun & Tietz, 2018). Job costing is usually used by companies that produce small units of unique products, such as Boeing, law firms, unique-house builders, and so on (Braun & Tietz, 2018). Companies using job costing track direct material, direct labor, and manufacturing overhead costs of a particular product by using a job cost record (Braun & Tietz, 2018). The cost information of direct materials and labor on a job cost record is posted from and verified by materials requisition and labor time records (Braun & Tietz, 2018). Manufacturing overhead costs are posted with one of three methods: activity-based costing, plantwide rate, or departmental rate (Braun & Tietz, 2018).

Activity-based costing (ABC) is the allocation method of manufacturing overhead (MOH) using the types of activities and the number of activities used (Braun & Tietz, 2018). ABC costing is more accurate than the allocation method using multiplying plant-wide or department-wide predetermined MOH rates if appropriately performed (Braun & Tietz, 2018). The four steps of ABC are: (1) the identification of activities and the estimation of the total MOH costs of each activity, (2) the selection of each activity's allocation base and the estimation of the number of activities used, (3) the calculation of the activity cost allocation rate for each activity, and (4) the allocation of MOH of each activity (Braun & Tietz, 2018).

2.2.2. Costing Method NIO Might Use and Probable Usage

In order to track direct materials and labor costs, job costing and activity-based costing might be appropriate for NIO's business operation. According to Bradsher (2021), customers can customize NIO's car, which sometimes forces a factory to create no exact same cars within a month. This characteristic of NIO's business operation suggests that job costing is more suitable than process costing based on their nature, discussed in the previous section.

In order to allocate manufacturing overhead costs, activity-based costing (ABC) may be more suitable for NIO than using plantwide or department-wide predetermined MOH rates. According to Braun and Tietz (2018), although the cost of designing, implementing, and maintaining ABC is generally higher than using predetermined MOH rates, ABC is beneficial for companies who are in competitive markets and have a high risk of cost distortion. Since NIO is in a competitive market (NIO, 2022a) and may have a high risk of cost distortion due to different models of and customizations of cars, ABC may be more suitable for NIO.

NIO might use the combination of job costing and activity-based costing (ABC) to determine the price of products and cut costs. Since job costing keeps track of direct material and direct labor costs and ABC reduces cost distortion (Braun & Tietz, 2018), NIO may be able to determine each unit of products effectively. In addition, NIO may be able to cut costs of unnecessary activities by having a more accurate picture of costs and determining value-added activities and non-value-added activities (Braun & Tietz, 2018).

NIO may use job costing and activity-based costing to conduct lean operations. Lean operation is a business operation whose purpose is to enhance customer value with waste elimination (Braun & Tietz, 2018). NIO's business operation shows some of the characteristics of lean operations, such as just-in-time (JIT) inventory, pull system (i.e., stating production after receiving orders), shorter manufacturing cycle times (i.e., the gap of time between the start and end of production), and high-quality products (Braun & Tietz, 2018). The fact that NIO has almost zero inventory (Bradsher, 2021) and produces cars after taking orders on NIO APP and events (NIO, 2022a) suggests NIO's JIT inventory philosophy and pull system. In addition, the fact that NIO's assembly line is twice as efficient as others in the industry (Bradsher, 2021) suggests the shorter manufacturing cycle times of NIO. Furthermore, NIO's high-quality products are suggested by the fact that "Nio scored 49 failures per 100 vehicles — the lowest for any car brand in China and much lower than the industry average" (Vats, 2022, para. 4).

2.3. Step 3 – Cost Behavior of NIO

The purpose of this step is to classify the costs of NIO described in the 122 and 123 pages of its annual report (i.e., NIO, 2022a) into variable, fixed, and mixed costs. There are three bases of cost classification: Cost of Sales, Research and Development Expenses, and Selling, General and Administrative Expenses (NIO, 2022a). Based on the author's knowledge, the costs in the three bases are reclassified according to business departments. Then, each cost is classified into either fixed, variable, or mixed costs based on the

author's knowledge. "Fixed costs (also known as *overhead*) are costs that do not vary with production or sales revenue" (Kotler, 2000, p. 463). "Variable costs vary directly with the level of production" (Kotler, 2000, p. 463). "Mixed costs contain both variable and fixed cost components" (Braun & Tietz, 2018, p. 314). In this section, the author defines production as the production of cars and related goods, such as accessories of cars. Based on this definition, research and development costs and selling, general and administrative expenses costs are classified as fixed costs. Finally, the cost driver of each cost is explored based on the author's knowledge and the annual report. The results are summarized in Table 1. The following paragraphs explain the reasons and rationale behind the cost classification (variable, fixed, or mixed) and the cost driver of each cost.

	Department	Primary Costs	Variable	Fixed	Mixed	Cost Driver
Cost of Sales	Production	Raw Materials	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The Number of Cars Sold
		MOH	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Overhead Absorption Rate
		Other Sales	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Various Cost Drivers
		Processing Fee	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The Number of Cars Sold
Research and Development (R & D)	Service	Warranty Expenses	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	The Number of Cars Sold
	R & D and Design	Design and Development	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Stage and Scale of Vehicle and Technology Development
		Employee compensation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Number of Employees
		Travel Expenses	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Number of Travels
Selling, General and Administrative	Marketing	Depreciation and Amortization	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Value of Assets
		Rental and Related Expenses	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Various Cost Drivers
		Marketing, Advertisement, and Promotion	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Scale of Marketing, Advertisement, and Promotion Activities
		Sponsorship and Racing Costs	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Sponsorship Fee
		Employee Compensation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Number of Employees
		Depreciation and Amortization	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Value of Assets
	Sales	Rental and Related Expenses for NIO Houses and Spaces	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Number of NIO Houses and Spaces
		Employee Compensation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Number of Employees
	Human Resources	Professional Service Expenses	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Fees Specified by Service Providers
		Depreciation and Amortization	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Value of Assets
		Professional Service Expenses	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Fees Specified by Service Providers

Table 1. The Cost Behavior of NIO

Note. This table summarizes the various types of costs described in the 122 and 123 pages of its annual report (i.e., NIO, 2022a) based on the author's knowledge and the annual report. In addition, the cost drivers of each cost are summarized based on the author's knowledge and the annual report.

2.3.1. Cost of Sales

Raw materials are variable costs whose cost driver is the number of cars sold. This is because the raw materials of vehicles usually change with the change in the volume of production.

Manufacturing overhead (MOH) is a mixed cost whose cost driver is the absorption overhead rate. This is because MOH is usually divided into variable MOH, such as production supplies, and fixed MOH, such as

security expenses of plants. The absorption overhead rate is the amount of per unit indirect costs (Kesavan, n.d.).

Other sales are mixed costs that have various cost drivers. NIO (2022a) mentioned that other sales included “parts and materials, labor costs, vehicle connectivity cost, and depreciation of assets that are associated with sales of service and energy packages” (p. 123). Parts and materials may be variable costs because they may change based on the number of parts and materials sold. Labor costs may be fixed costs if employees get fixed salaries and benefits. Therefore, other sales are mixed costs.

The processing fee is a variable cost whose cost driver is the number of cars sold. The reason behind this classification of the cost and identification of the cost driver is the following information: the group pays a processing fee to JAC for each vehicle produced (NIO, 2022a).

Warranty expenses are variable costs whose cost driver is the number of cars sold. This classification of the cost and identification of cost driver is because a warranty reserve is accrued for all new vehicles sold as warranty liabilities (NIO, 2022a).

2.3.2. Research and Development Expenses

Design and development expenses represent “consultation fees, outsourcing fees and expenses of testing materials” (NIO, 2022a, p. 123). Its cost driver is determined as the stage and scale of vehicle and technology development based on the fact that they drive the research and development expenses (NIO, 2022a).

Employee compensation includes “salaries, benefits and bonuses as well as share-based compensation expenses for our research and development staff” (NIO, 2022a, p. 123). Its cost driver is determined as the number of employees based on the fact that the number of employees in the research and development (R&D) department drives the R&D expenses (NIO, 2022a).

The cost driver of travel expenses is considered the number of travels because there is usually a positive relationship between these two variables.

The cost driver of depreciation and amortization of research and development equipment is their value. This is because the asset cost and salvage value influence depreciation and amortization expenses.

There are many cost drivers of rental and related expenses because they include “rental and related expenses with respect to laboratories and offices for research and development teams and others, which primarily consists of telecommunication expenses, office fees and freight charges” (NIO, 2022a, p. 123).

2.3.3. Selling, General and Administrative Expenses

The cost driver of marketing, advertisement, and promotion expenses is their scale because the expenses are usually influenced by the marketing medium, duration of the advertisement, the number of advertisements, and so on.

The cost driver of sponsorship and racing costs of NIO's Formula E team is the sponsorship fee. I assumed that NIO pays fixed annual sponsorship for its Formula E team.

The cost driver of employee compensation is the number of employees based on the fact that the number of employees related to selling, general and administrative expenses drives selling, general and administrative expenses (NIO, 2022a).

The cost driver of depreciation and amortization of assets, including IT equipment and software, leasehold improvements, and so on, are their value. This is because the asset cost and salvage value influence depreciation and amortization expenses.

The cost driver of rental and related expenses for NIO Houses and Spaces is the number of NIO Houses and Spaces. This is based on the fact that an increasing number of NIO Houses and Spaces drives general and administrative expenses (NIO, 2022a).

The cost driver of employee compensation is the number of employees in the sales department based on the same reasons discussed above.

The cost driver of professional service expenses for the design of NIO Houses and Spaces are the fees specified by service providers. This is based on the assumption that the expenses change by different variables, such as the size, design, and location of buildings.

The cost driver of depreciation and amortization is the value of assets in the marketing department based on the same reasons discussed above.

The cost driver of professional service expenses for human resources is fees specified by service providers. This is based on the assumption that NIO pays fixed fees specified by the service providers every period.

2.4. Step 4 – Cost Volume Profit Analysis of ES8

Although NIO produces different car models, this step focuses on a specific model, ES8, to conduct the cost volume profit analysis. This is because ES8 is NIO's first production model introduced in 2017

(ZIPPIA, n.d.), and much more information is available than other models. Firstly, this step explores the characteristics, price, target customer, and yearly unit of delivery of ES8. Then, this step analyzes the break-even point of ES8. This section uses units of delivery rather than units of sales because the latter information was difficult to attain.

2.4.1. ES8: Characteristics, Target Customer, Price, and Yearly Unit of Delivery

ES8 is a six or seven-seat smart electric SUV model introduced in 2017 (NIO, 2022a). NIO started the delivery of ES8 on June 28, 2018 (NIO, 2019a). ES8 reaches 100 kph in less than 5 seconds and is capable of running from 450 to 850 km, depending on the type of battery (NIO, 2022a). The minimum price of ES8 is \$68,000 USD (O’Kane, 2017).

The target customer of ES8 may be a large family or people who need a large space. NIO currently produces three models of SUVs: ES8, ES7, and ES6. Although the number of seats for ES6 and ES7 is five, that for ES8 is six to seven (EVSpecifications, n.d.; Parikh, 2022). A family consisting of more than five members needs ES8. In addition, ES8 can ensure a large space by folding the extra seats for skiing, fishing, camping, and so on. The following Table 2 and Figure 2 represent the yearly number of deliveries of ES8.

Quarter/Year	2018	2019	2020	2021
Q1		3,989	195	4,516
Q2	100*	3,140	2,263	4,433
Q3	3,268	603	3,530	5,418
Q4	7,980	1,400	4,873	5,683
Total (Full Year)	11,348	9,132	10,861	20,050

Table 2. The Quarterly and Yearly Number of Deliveries of ES8

Note. This table represents the number of ES8 deliveries. Although delivery information on Q1 and Q2 in 2022 was available online, the author could not find delivery information on Q3 and Q4 in 2022. Therefore, 2022 was extruded from the analysis. Information is derived from the following sources: (NIO, 2019a; NIO, 2019b; NIO,

2019c; NIO 2019d; NIO 2020a; NIO, 2020b; NIO, 2020d; NIO, 2020e; NIO 2021c; NIO 2021d; NIO 2021e; NIO 2021f; NIO, 2022c). *This is the number of ES8 delivered between June 28 and June 30, 2018 (2019a).

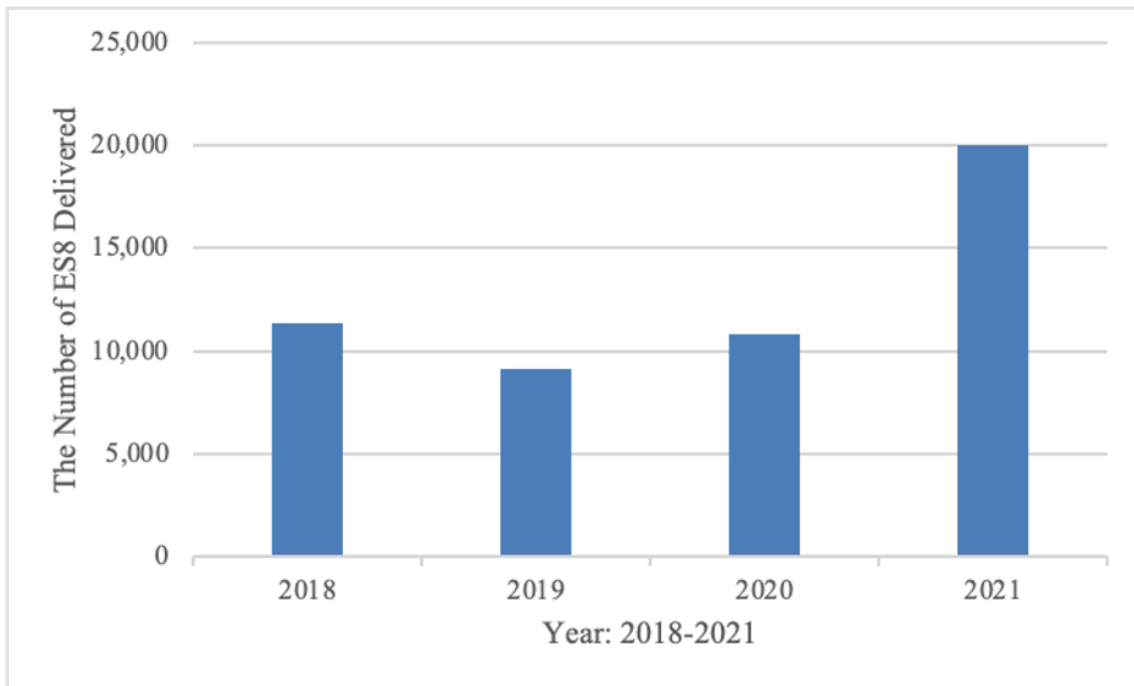


Figure 2. The Yearly Number of Deliveries of ES8

Note. This is the graphical representation of the yearly deliveries of ES8. X-axis represents the year. Y-axis represents the number of ES8 delivered in a year. Information is derived from the “Total (Full Year)” row of Table 2. It is important to note that the bar in 2018 only contains deliveries in Q3, Q4, and three days in Q2 because NIO started the delivery of ES8 on June 28, 2018 (NIO, 2019a).

2.4.2. The Break-Even Point of ES8

This section calculates the break-even point of ES8 between 2018 and 2021 based on some assumptions. The break-even point is the point at which the total revenue is equal to the total expenses (Braun & Tietz, 2018). In order to find the break-even point in units, fixed expenses have to be divided by the contribution margin per unit, which “is the excess of the selling price per unit over the variable cost per unit” (Braun & Tietz, 2018, p. 284). In this section, the break-even point in units is calculated based on the following assumptions: (1) the price of ES8 is \$68,000 USD (O’Kane, 2017), (2) the contribution margin per ES8 is

the price of ES8 times vehicle margin, (3) fixed expenses is operating expenses times the percentage by ES8 deliveries in the total vehicle deliveries. The following Table 3 shows the calculation.

	(A) Price of ES8	(B) Vehicle Margin	(C) Delivery Percentage	(D) Operating Expenses	(E) Fixed Expenses (C×D)	(F) Contribution Margin (A×B)	Break-Even Point in Units (E /F)
2018	\$68,000	-1.60%	100%	-\$1,395.6 million	-\$1,395.6 million	-\$1,088	NA
2019	\$68,000	-9.90%	$9,132/20,565 \times 100 = 44.41\%$	-\$1,591.4 million	-\$706.74 million	-\$6,732	NA
2020	\$68,000	12.70%	$10,861/43,728 \times 100 = 24.84\%$	-\$706.2 million	-\$175.42 million	\$8,636	20312.64
2021	\$68,000	20.10%	$20,050/91,429 \times 100 = 21.93\%$	-\$705.6 million	-\$154.74 million	\$13,668	11321.33

Table 3. The Calculation of The Break-Even Points in Units of ES8

Note. Information on vehicle margin in a year, operating expenses in a year, and total number of vehicles delivered in a year were derived from the following source: (NIO, 2019b; NIO 2020a; NIO, 2021c; NIO, 2022c). The number of ES8 delivered in a year was derived from Table 2. Break-even points in units in 2018 and 2019 were not calculated because the negative contribution margin per ES8 makes it impossible to reach the break-even point.

Comparing Table 2 and Table 3, it is suggested that the break-even point in units was surpassed only in 2021. This means that ES8 produced profit only in 2021. However, it is important to note that this calculation is based on a set of assumptions and the actual numbers may be different.

2.5. Step 5 – NIO's Environmental Sustainability Practices and Budgeting

In line with the global attention toward global climate change, NIO recognizes the importance of its efforts to make positive impacts on the planet with the use of its technologies and business-to-business

and business-to-consumer relationships (NIO, 2022a). On January 18, 2023, NIO was named the 79th most sustainable company by Corporate Knights on the *Global 100 ranking of the world's most sustainable companies* list (NIO, 2023). The following paragraphs explain the potential impacts of NIO's sustainable practices on its budgeting.

- NIO conducts research on sustainable materials to design and develop its products (NIO, 2022a). Since this practice is related to the research and development and design in the value chain, it should affect its operating expenses budget.
- NIO utilizes sustainable energy (e.g., solar energy and ground-heat energy) to run its manufacturing plants and partners' facilities (NIO, 2022a). Since this practice is related to the production in the value chain, it should affect its direct materials budget and/or manufacturing overhead budget.
- NIO recycles water, aluminum, and other materials to create eco-friendly products (NIO, 2022a). This practice should also affect the direct materials budget and/or manufacturing overhead budget for the same reason.
- In 2021, NIO launched the Blue Point Plan to trade users' carbon credits with NIO points (NIO, 2022a). Since this practice is related to customer service in the value chain, it should affect its operating expenses budget.

This section explained how NIO's environmental sustainability practices might affect its budgeting. In addition, NIO's operating and financial budgets may be influenced by its social sustainability practices, including ensuring and improving the safety and quality of its products, enhancing its working environment, fostering young talents by sponsoring Formula E Student China, and funding and donating money to fight against COVID-19 pandemic and natural disasters (NIO, 2022a).

2.6. Step 6 – Performance Evaluation and KPIs of NIO

NIO evaluates its business not only from the financial perspective but also from other perspectives of the balanced scorecard. The balanced scorecard suggests the importance of evaluating the performance of a business from both financial and operational perspectives (Kaplan & Norton, 1992). Although NIO does not specify which segments it uses to evaluate its financial performance, the fact that NIO (2022a) keeps track of each model's sales performance implies that NIO may evaluate its financial performance based on each model (segment). In addition, NIO (2022a) evaluates its performance by conducting the product lifecycle carbon footprint evaluation and by measuring energy consumption. It is also implied that NIO (2022a) evaluates its performance by keeping track of the hours of training employees receive and by

conducting an employee satisfaction survey. NIO (2022a) also tries to ensure and improve the quality of products by conducting various tests, monitoring quality issues, and gathering customer feedback.

Conclusion

This paper analyzed NIO's management activities using its annual report and other secondary sources. This is because little research about NIO's management has been conducted. This paper follows nine steps to analyze NIO's management. Step 1 explores NIO's value chain; step 2 discusses costing methods suitable for NIO; step 3 classifies NIO's costs into variable, fixed, or mixed costs; step 4 conducts cost volume profit analysis for ES8; step 5 analyzes the impacts of NIO's sustainable practices on its budgeting; step 6 discusses KPIs NIO might use to evaluate its business performance.

There are several limitations to this paper. Firstly, since this paper used some assumptions and imaginations to analyze the limited disclosed information about NIO's business management, some analyses may be different from the actual business management strategies NIO takes. Secondly, this paper may be subject to the author's biases because this paper did not use a systematic approach to analyze secondary information. Thirdly, this paper may miss important information because of the lack of a systematic approach and the limitation of time and resources.

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