

CHINESE ELECTRIC VEHICLES IN THE THAILAND MARKET: OPPORTUNITIES AND CHALLENGES

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Abstract

This study adopts a qualitative research approach, and the main research objective is to analyze the current and future electric vehicle market in Thailand. The research tools are mainly used to read relevant literature and synthesize official data from the Thai government as well as Chinese Electric Vehicles manufacturers to draw conclusions. The study concludes that there is a huge future market for electric vehicles in Thailand and Chinese brands will dominate the market.

Keywords: Qualitative research, Electric Vehicle Markets in Thailand, Electric Vehicles, Chinese Electric Vehicles, Marketing mix 7ps

Introduction

This article is intended for 1) To study the market survey of electric vehicles in Thailand. 2) To study the market survey of Chinese brand electric vehicles in Thailand. 3) To study the development of Chinese electric vehicle brands in the future electric vehicle market in Thailand.

This research mainly wants to use the data of some research institutions and Thai government departments to study the market and future market development of electric vehicles in Thailand, as well as, the current status of Chinese brand electric vehicles in Thailand. Tools used for data collection are the literature and official data released by the government and electric vehicle manufacturers. In terms of research methods, qualitative research methods are used.

The results showed that 1) Thailand is the largest automobile producer in Southeast Asia, and with this advantage, the active development of the electric vehicle industry will help Thailand's industrial development. 2) In order for Chinese EVs to develop and expand in Thailand's auto market, auto companies should analyze the localization of Chinese branded EVs in Thailand. 3) The research found the reasons why electric vehicles are currently underrepresented in Thailand, and the reasons why, through the study,

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the Thai market will greatly accept electric vehicles in the future. 4) The study provides an understanding of the Thai electric vehicle market environment and enables the study to effectively guide Chinese electric vehicle companies to do business in Thailand.

Background

Electric vehicles are on the rise in Thailand, with a growing number of car manufacturers and consumers. Thailand's vehicle manufacturing sector is expecting great growth in the next few years due to stricter emission regulations. Thailand has a great deal to offer electric vehicle manufacturers. However, the country has a few hurdles to jump before it can become the EV hub it's hoping for.

Thai car companies are quickly catching up with Chinese automakers in EV technology and manufacturing. Honda and Toyota have both launched their electric cars in Thai streets, ready to take on the Thai market. Several car manufacturers are launching their own EV models to compete with the Chinese models. This is great for the environment as it reduces pollution and cuts down on fuel costs. EVs also reduce accidents caused by drivers who are still getting used to driving them. All manufacturers are looking for ways to make electric vehicles accessible to the public and they're succeeding.

Chinese manufacturers are also adapting to Thai buyers' wants and needs. EV manufacturing is still relatively new to China. However, several Chinese automakers are developing models specifically for the Thai market. These cars are often cheaper than Chinese models, making them accessible to all income levels. Plus, they look great and have many advanced features compared to Thai cars. Chinese automakers understand that Thailand is ready for electric vehicles; they're ready to invest and ready to buy!

Many Thais have been purchasing Chinese electric cars over their local models. The main reason is cost but there are several other factors that should be considered. Chinese electric cars cost around \$15,000 while Thai cars cost around \$30,000 but they're both of similar quality and durability. A large percentage of Thais live in cities where parking is easy and plentiful. However, rural areas lack urban conveniences like garages or parking lots for cars. Electric vehicles solve these problems by allowing people to easily move around both urban and rural areas alike. Thailand has a lot going for it when it comes to EV manufacturing.

To sum up, compared with Japanese, European, and American brands of electric vehicles, Chinese brands of electric vehicles have a huge advantage in terms of production capacity and cost performance.

The target group, and area of the study focuses on the electric vehicle market in Thailand, and the Chinese brand companies currently selling/producing electric vehicles in Thailand. The researcher, as a Chinese scholar who has lived in Thailand for more than 5 years and has an interest in automobiles. It is hoped that this study will be the beginning of promoting the development of electrification in the Thai automotive market and the main motive of promoting the sales of Chinese brand electric vehicles in Thailand.

The main objective of the study is to draw conclusions through the theory of Marketing Mix 7Ps by qualitative research on the publicly available reports from Thai government and car manufacturers. And

to analyze the strengths/disadvantages/opportunities/challenges of the Thai EV market through the corresponding conclusions.

The History of Electric Vehicles: Beginning with the invention of the first automobile in 1886 and continuing through the development of the auto production line 30 years later and the dramatic impact this had on making cars a mass-market product that slowly became accessible worldwide, the development of the engines that power vehicles has been ongoing throughout the more than 130-year history of powered land transport. It has continued up to the present day. The dominant source of motion for cars has previously been the internal combustion engine (ICE), but recently, a substantial shift has occurred, and the usage of electric motors is becoming more prevalent. The growth of the electric vehicle (EV) segment as a result of this progress has been significant in making the car one of the primary elements of modern living worldwide.

These now come in a variety of configurations, such as battery electric vehicles (BEVs), which lack an internal combustion engine and are entirely powered by an electric motor that needs to be plugged in to recharge, plug-in hybrid electric vehicles (PHEVs), which are similar to HEVs but also allow for direct recharging from a plug-in source of electricity, and hybrid electric vehicles (HEVs), which combine the power of ICEs and electric motors.

Electric cars were originally created in the 1880s, thus despite the general perception that they are a new development, they made their debut at the same time as ICE-powered vehicles. These early EVs were almost as popular during the following 30 years as gasoline-powered cars, but as road networks expanded in Europe and the USA and encouraged people to go farther, their slow speeds and limited range became a bigger concern. As a result, customer interest in EVs declined, and instead, ICE-powered cars completely dominated the market. It took almost a century for EV development to rekindle consumer interest in EVs.

Electric Vehicles in Thailand: As of September 30, 2021, Thailand has 3,547 battery electric vehicles, rising 92.56 percent from the previous year, according to club vice president and spokesperson Surapong Pisitpattanapong. "In the meantime, the number of HEVs (hybrid electric vehicles) was 180,175 units, up 11.29 percent year on year." Plug-in hybrid electric cars (PHEVs) totaled 29,401 units, up 337.25 percent year on year. "The government has been encouraging indigenous manufacturers to produce electric buses. We predict that up to 500 units will be produced locally this year, and the government has set a target of using 282,240 electric cars, or 26% of total vehicles utilized in Thailand, by 2027, and manufacturing at least 380,250 electric vehicles, or 17 per cent of the nation's total production of vehicles. (The Nation Thailand, 2021)

China's Electric Vehicle Exports: In 2021, the Chinese mainland sold over 3.2 million electric vehicles (EVs), accounting for nearly half of total global EV sales. According to the most recent data, the country also exported the most EVs last year.

The number of passengers EVs exported in 2021 climbed 2.6 times to 499,573 units, according to statistics from China's General Administration of Customs. China is quickly taking over as the world's EV manufacturing, producing close to 60% of all EVs now. (Nikkei, 2021)

Global EV Revolution in China: Numerous Chinese businesses, many of which are being only a few years old, are already introducing competitive EVs to the Chinese market as a result of significant investment.

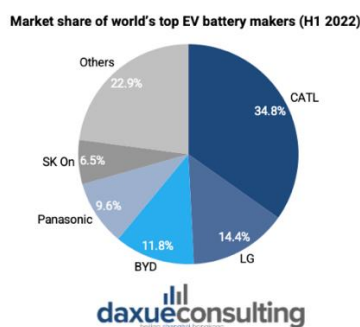
According to Ron Zheng, head of Roland Berger's China automotive business, "many Chinese OEMs, whether they are newbies or well-established, perceive the present EV trend as a vital chance to alter China's automotive sector." "These businesses are investing enormous sums of money to improve the performance of their products and expand their consumer base."

The design of electric cars has helped Chinese EV manufacturers compete more fairly internationally. Since electric automobiles require significantly fewer components than ICE vehicles, they are easier to design and manufacture. This frees up resources like time and money to create and implement cutting-edge technology like artificial intelligence and self-driving cars. For instance, NOMI, the world's first in-vehicle AI, is a feature of NIO's automobiles and has now had over 200 million human interactions.

Contemporary Amperex Technology Ltd., situated in Ningde, was founded in 2011 and has grown quickly to become the largest battery manufacturer in the world, with a \$200 billion market cap. NIO has said that its ET7 car, which will debut on the Chinese market in early 2022, would have a record-breaking range of more than 1,000 kilometers thanks to modern 150 kilowatt-hour solid-state batteries from CATL.

China has a strong position in the battery industry: One of the essential parts of electric cars, batteries make about 40% of the overall cost of an EV. China has a lot of the rare earth elements needed for batteries. China will produce 1.5 million tons of lithium in 2021, or 6.8% of the world market. Chinese firms own a sizable portion of the world's major lithium mines, which are mostly located in South America and Australia. For instance, Terryson, which owns the largest and finest quality spodumene mine in Western Australia, is 51% owned by China's Tianqi Lithium Corporation. With a market size of 324GWh, or 59.4% of the worldwide market, China is now the world's largest supplier of batteries. Additionally, between 2022 and 2027, the Chinese battery market is predicted to grow at an astounding 7.5% CAGR.

Contemporary Amperex Technology Co. Limited (CATL), a Chinese domestic battery company, ranked first in the world for the previous five years and with a market share of 32.5% in 2021. Six of the top ten global corporations in 2021 were Chinese firms, highlighting China's strength and capability in managing domestic manufacturing.



Figurer 1. Source: SNE research, designed by daxue consulting, market share of EV battery markers in H1 2022

Beyond the scale of manufacturing, the technology employed, and the caliber of Chinese batteries are comparable to those of Western nations. Many globally recognized automakers select Chinese businesses as their battery suppliers. For instance, CATL became the battery provider for Volkswagen MEB in March 2018 and three months later, BMW placed an order for CATL worth USD 1.02 billion (RMB 6.9 billion). Then, in February 2020, CATL started working as one of Tesla's battery suppliers.

Overseas expansion of Chinese brand electric vehicles: Many Chinese EV manufacturers are looking outside of China now that they have developed and established a market foothold there. Chinese automakers have long struggled to get a foothold in developed countries, but they are now hoping to take advantage of a changing attitude toward their goods and the growing demand from European customers for reasonably priced EVs with good range and cutting-edge technology. An analysis by Schmidt Automotive Research, based in Berlin, found that 23,800 Chinese EVs were sold in Western Europe in 2020, an increase of 1,290% from the previous year.

Oil prices keep increasing 2022: World oil prices have been rising in 2021-2022 because of the war and Covid-19, and Thailand cannot avoid it. Thailand's monthly crude oil imports increased by 63% during 2020 and 2021, from 37.2 billion to 60 billion baht. The average monthly price of imported refined oil climbed by 20% to 2.34 billion baht, according to the Energy Ministry. (Bangkok post, 2022)

Research Objectives

1. Study the current Thailand electric vehicle market capacity and analyze the Thailand electric vehicle market capacity in 2035.
2. Study the current market share of Chinese electric vehicles in Thailand and the likely market share in 2035.
3. Use Marketing mix 7ps to study the market of Chinese brand electric vehicles.
4. SWOT analysis findings for electric automobiles of Chinese brands in Thailand.

Principles, Concepts, and Related Theories

Research Benefits: Through this research, forecast the electric vehicle market in Thailand in 2035, and the market share of Chinese brand electric vehicles in Thailand. And based on the forecast, combined with Marketing mix 7ps to analyze the market of Chinese brand electric vehicles, and finally combined with SWOT to draw a conclusion.

Literature Review

Electric Vehicles: A car that is powered by one or more electric motors is known as an electric vehicle (EV). It can be powered by a collection system, extravehicular sources of electricity, or by a battery on its own (sometimes charged by solar panels, or by converting fuel to electricity using fuel cells or a generator). (Faiz, Christopher, & Walsh, 1996)

Electric vehicle industry in China: Since consumer transportation is responsible for 17% of the world's greenhouse gas emissions, the rationale for electrifying this sector is indisputable given the growing worries about climate change. Compared to other nations across the world, Chinese consumers are adopting

electric cars (EV) at a quicker rate. 2.92 million electric car sales were made in China in 2021, which accounted for 53% of the worldwide market share. Government incentives and the commitment to the 2060 carbon neutrality objective are important motivators for EV purchases. This article will evaluate the growth of the EV sector, explain the traits of its users, and include a case study on one of China's most popular electric car manufacturers, NIO, to show how it continues to explore this developing market in order to grasp the continued trend of EV adoption.

The Chinese government actively promotes the growth of the EV sector through financial aid for car purchases and other strategies. EV buyers have received USD 14.8 billion (100 billion RMB) in subsidies since 2009, although direct governmental help was slated to stop in 2020. However, the central government has maintained financial incentives and extended the purchase-tax exemptions of EVs through 2022 in order to support the recovery of electric car sales in 2020, albeit at lower rates. With the help of these recent incentives and massive investments in charging infrastructure, the market for EVs is predicted to increase at a pace of 30.82% in 2022, with an estimated volume of 3.82 million vehicles sold.

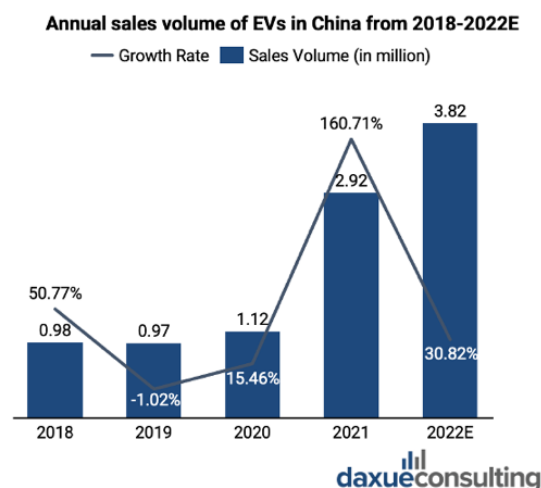


Figure 2. Source: China Association of Automobile Manufacturers, designed by Daxue Consulting, Annual sales volume of EVs in China

Lithium-ion battery: The majority of electric automobiles use lithium-ion batteries (Li-Ions or LIBs). When it comes to energy density, battery life, and power density, lithium-ion batteries perform better than the majority of other usable batteries. Safety, durability, thermal breakdown, environmental effect, and cost are all complicating considerations. To work safely and effectively, Li-ion batteries should be operated within safe temperature and voltage limits. (Lu, Han, Li, Hua, & Ouyang, 2013) The cost of lithium-ion batteries is always reducing, which contributes to the lower cost of electric cars.

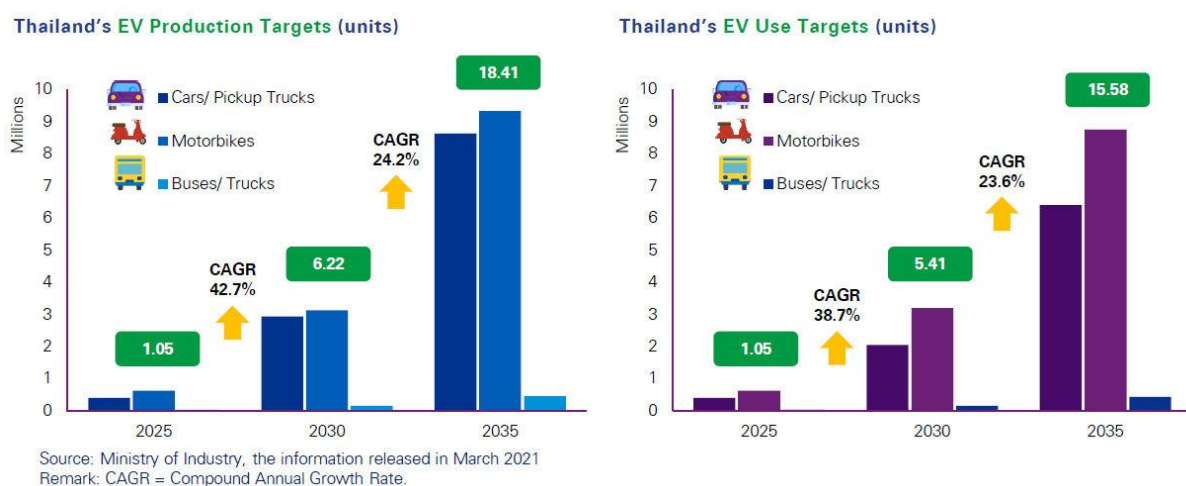
Environmental aspects of the Electric Vehicles: Electric vehicles (EVs) have a lower environmental impact than traditional internal combustion engine automobiles (ICEVs). While some aspects of their production may have similar, less, or alternative environmental effects, they produce little or no

tailpipe emissions and reduce dependence on petroleum, greenhouse gas emissions, and health effects from air pollution (Yuksel, Tamayao, Hendrickson, Azevedo, & Michalek, 2016; Holland, Mansur, Muller, & Yates, 2016)

Beyond the resource utilized to generate your electricity, the efficiency of electric cars is another factor that makes them more environmentally friendly than conventional automobiles. Approximately 17 to 21% of the energy is turned into electricity for the automobile when the gasoline in traditional vehicles burns to drive the car. However, EVs can convert between 59 and 62 percent of the electric energy into usable electricity.

Car buyers sometimes consider MPGe, or miles per gallon equivalent, when contrasting an electric vehicle (EV) choice to a traditional gasoline vehicle (or even a hybrid option) (of gasoline). The number of miles a vehicle can travel using the same (or equal) amount of energy that would be found in a gallon of gasoline is used by the EPA to compute MPGe. A normal gasoline-powered automobile gets around 24.7 miles per gallon on average. Though far more efficient than in the past, but still pales in comparison to the MPGe of electric vehicles now on the market. Recently current electric cars may achieve a similar "fuel economy" of up to 100 MPGe, which is more than four times as efficient as conventional automobiles.

Thailand's EV Production Targets (Units): Electric vehicles, or EVs, are gaining popularity in Thailand. EV is a game changer in the context of transportation industry reform and the push toward decarbonization. All stakeholders, including the government, businesses, and consumers, who are increasingly turning to EVs as part of their personal carbon journeys, are driving the trend. As a consequence, Thailand has created a favorable legislative environment for providing the necessary push to the EV market and accelerating the growth of EV manufacturing and the associated value chain.



Figurer 3. Thailand's EV Production and Use Targets

From Figure 3, it can be predicted that there will be 8-9 million electric vehicles in Thailand by 2035. Compared to 2025, the growth rate of holdings is greater than 65%. Electric vehicle users will also be 6-7 million people. The growth rate is greater than 70%.

Chinese EV brand in Thailand's EV Market: SAIC Thailand claims that its two imported EV models, the MG ZS EV and MG EP, which launched in 2019, now account for around 90% of Thailand's pure electric vehicle market. GWM intends to offer nine hybrid and pure EV models within three years and, in the long term, to develop a local industrial chain for EV production, according to Elliot Zhang, president of GWM ASEAN and Thailand.

Midway through October, not long before the auto shows, the automaker's EV sub-brand ORA unveiled the Good Cat model. According to GWM, about 2,000 pre-orders had been placed before the end of November.

A free trade agreement between ASEAN (Association of Southeast Asian Nations): As a result of this deal, China permits Chinese manufacturers to sell EVs to Thailand duty-free, boosting the price competitiveness of Chinese EVs. However, once Thailand's EV market becomes significant, Chinese, and other overseas manufacturers would consider establishing local EV production lines.

Marketing Mix 7Ps: The marketing mix is also known as the 4Ps and the 7Ps. The four Ps are price, place, product, and promotion. Price, place, product, promotion, process, people, and physical evidence are the seven Ps. The marketing mix 7Ps model has acquired a lot of popularity in recent years, and marketing is becoming more relevant as a separate topic of study. (Bitner, & Booms, 1981) The model expands the marketing mix by three more "Ps" that are directly related to the service industry. People, tangible evidence, and the process are all examples of this.

The 4Ps/7Ps are a crucial strategic tool that small organizations may use to choose their scope, even though it is sometimes considered outdated. Using the Business Model Canvas for marketing strategy is a terrific choice for businesses currently examining price and revenue models since it provides a clear framework to adhere to.

The 7Ps concept may be applied by businesses to goal setting, SWOT analysis, and competitive analysis. It's a useful framework for assessing an existing company and considering relevant strategies while analyzing the components of the marketing mix.

S. W. O. T: SWOT analysis (or SWOT matrix) is a strategic planning and strategic management method that may help a person or organization identify strengths, weaknesses, opportunities, and threats in commercial competition or project preparation. It is often referred to as scenario analysis or situational analysis. (Weihrich, 1982).

This method may be used to assess the strategic position of a variety of companies and is intended for use in the early phases of decision-making processes (for-profit enterprises, local and national governments, NGOs, etc.). (Silva, 2010) It aims to pinpoint the internal and external elements that are advantageous and detrimental to attaining the goals of the project or enterprise. In order to make a SWOT analysis helpful and discover their competitive advantage, users often ask and respond to questions to provide relevant information for each area. SWOT has been referred to be a tried-and-true instrument of strategic analysis, but it has also faced criticism for its shortcomings, leading to the development of substitutes. (Sevier, 2001).

Research Methodology

The qualitative research approach was applied in this study. The study of the nature of phenomena is described as "the study of their quality, distinct manifestations, the environment in which they exist, or the perspectives from which they might be observed," but excludes "their range, frequency, and location in an objectively specified chain of cause and effect" (Graff, Vernooij-Dassen, Thijssen, Dekker, Hoefnagels, & OldeRikkert, 2007) A more practical rule might be added to this formal definition: qualitative research frequently uses verbal data rather than statistical data (Punch, 2013).

This study uses a qualitative research method in which the researcher used a web-based format to collect a large amount of literature on electric vehicles in Thailand, as well as, using various official data published by the Thai/Chinese government. The official data from the branches of Chinese brands in Thailand were combined to obtain the research findings. In the data analysis, we mainly use the theory of Marketing Mix 7Ps to summarize the data and obtain the final results. And at the end, when drawing final conclusions as well as giving recommendations, SWOT theory is used to discuss the conclusions that should be given in this paper in each of the four dimensions.

Research Results and Discussion

Marketing Mix 7Ps

1. Product: China's electric vehicle industry is the largest in the world, accounting for 54% of the world's production. By 2030, industrial output is anticipated to reach 5,500 GWh globally, with Chinese firms having already announced 3,000 GWh of that output, having an almost monopoly held by Chinese producers. On the other hand, considering China's innovation and development in the field of 5G, mobile internet and AI intelligence in recent years, there is no doubt that it can give Chinese branded electric vehicles an unparalleled appeal.

2. Price: Because China controls the manufacture of batteries, which account for two-thirds of the cost of electric vehicles, Chinese-made electric vehicles are among the most affordable in the world. Great Wall Motor, a Chinese car maker, has reached an agreement with the Thai government to cut the retail price of its electric vehicles, with the goal of growing local EV sales and manufacturing. The arrangement, which includes a government subsidy and a decrease in value-added tax, may save consumers up to 160,000 baht (US\$4,779) each unit, according to Michael Chong, General Manager of Great Wall Motor Thailand. A similar arrangement has also been linked with SAIC-CP Motor, the Thai subsidiary of SAIC Motor Corp.

3. Promotion: The government has allowed a series of incentives, including lower excise taxes and import fees on key auto parts, in a move to make electric automobiles (EVs) more alluring to both car buyers and manufacturers. For passenger automobiles with batteries ranging from 10 to 30 kilowatt-hours (kWh), a 70,000-baht subsidy is available per unit, while fully knocked-down (CKD) and completely built-up (CBU) units are eligible for a 150,000-baht subsidy. CKD trucks with batteries larger than 30 kWh are eligible for a 150,000-baht incentive per unit.

In view of the fact that the export of electric vehicles itself is also a foreign export project strongly supported by the Chinese government, so Chinese brand electric vehicles have a great discount from the beginning of the export price.

4. Process: In this section, we will describe the process through the eyes of a Chinese company selling electric automobiles in Thailand. The MG brand of China's Shanghai Automotive Industry Corporation (SAIC Motor) is the first Chinese electric car brand to enter Thailand. MG has partnered with Thailand's CP Group to enter the Thai vehicle industry and is currently present in Thailand. It has established a fast popular and successful brand after investing in the development of a car manufacturing, with sales of more than 50,000 vehicles in five years, and the target of 100,000 vehicles is likely to be met. China Great Wall Motor Company, which recently announced its plan to purchase General Motors' Chevrolet factory in Rayong Province, is closely behind it.

Geely Automobile, which purchased Volvo Passenger Cars, and Changan Automobile are the other Chinese EV manufacturers. Foton Motor, which specializes in pickup trucks and commercial vehicles, has also established and begun operations in Thailand.

5. People: Under this factor, we think the main analysis is the behavior of consumers in Thailand. At present, the main sales competitors of Chinese brand electric vehicles in Thailand are a number of old European car manufacturers such as Tesla and Mercedes-Benz, BMW and Audi in the United States. Electric vehicles from Chinese brands are much more affordable than their sales in Thailand and have their own established customer base.

6. Place: Under this factor, we think the localization of Chinese brand EVs should be analyzed. At present, Great Wall Motors and MG Motors have established local factories in Thailand, with an annual output of up to 1 million vehicles. Compared with other European and American brands, the advantages of Chinese automobile companies to build factories in Thailand are obvious. The main advantages are local tax breaks and the ability to make timely production adjustments to local Thai driving habits and car buying behavior.

7. Physical Evidence: For this factor, the research focuses on the technology/shape of Chinese brand EVs and others. The current car trend in the world is the popular large-screen central control and advanced car configuration. These are all owned by Chinese brand electric vehicles. Especially in Thai car culture, SUVs and large SUVs and pickup trucks are popular. Chinese auto companies are targeting this, and it is these types of electric vehicles that are widely sold in Thailand.

Research limitations

The main limitation of this study lies in several aspects, the first aspect is our personal language level, especially the Thai language level limitation, many of the documents involved in this study are written in Thai and we can only read them in the form of translation, which can be expected to have many obstacles and poor understanding.

The second limitation is that there are hundreds of Chinese brands of EVs, and only 5 of them are sold in Thailand, so this study can only be limited to these 5 brands and does not fully represent the study of Chinese brands of EVs.

The last research limitation is the limitation of government policies. The Thai government often changes its policies at will and changes them from time to time, so that a certain policy does not work in the long run. This is also a point that seriously affects the academic value of this study.

Conclusions and Recommendations

The results from the 1st objective research found that Thailand's automotive industry is one of the largest in Southeast Asia, and the country is the second largest consumer of pickup trucks. As a result, EVs are gaining more and more attention in Thailand. But China being a major EV country, Chinese brands of EVs are selling much cheaper in Thailand than the established European car manufacturers and have their own established customer base. This may be due to several Chinese car companies have signed agreements with the Thai government that include government subsidies and reduced VAT to lower the retail price of their electric cars, in the hope that when the time is right, they can establish electric vehicle production lines in Thailand to reduce costs and increase sales which corresponds Figure 3, it can be predicted that there will be 8-9 million electric vehicles in Thailand by 2035. Compared to 2025, the growth rate of holdings is greater than 65%. Electric vehicle users will also be 6-7 million people. The growth rate is greater than 70%.

The results from the 2nd objective research found that for Chinese EVs to develop and expand in Thailand's auto market, auto companies should analyze the localization of Chinese branded EVs in Thailand. As a result, they should establish local factories in Thailand to accelerate the increase of awareness and sales; and they should always pay attention to the car culture in Thailand and understand the popular car models in Thailand. Since then, it is necessary to study the current market situation of electric vehicles in Thailand through relevant data in order to propose a marketing approach that is in line with the situation in Thailand.

The results from the 3rd objective research found that combined with the theory of Marketing Mix 7Ps, we know that the main advantage of Chinese electric car brands is the cost performance, and production. In particular, key EV technologies such as batteries and motors, as a result, will initially be many barriers in the way of progress on the demand side. Overcoming these will help to advance the widespread adoption of EVs, possibly much sooner than many parties had anticipated. As a result, even though players in the auto sector who take the risk to enter, significant risk will be there in the EV industry, but the Chinese corporation might very well be rewarded with a dominant market share. Conversely, players who hesitate and delay in the face of these just developing issues run the danger of losing out on important business opportunities. Because of this, as is frequently the case, only those that are fast to change their business viewpoint will be able to benefit from what might be very significant future prospects in the Thai EV industry.

The results from the 4th objective research found that the development of Chinese brand electric vehicles in Thailand and summarized using the theory of SWOT. As a result, this is because EVs are still in

the early stages of development, and because the technology used in them is improving quickly and continuously, consumers naturally prefer new cars to used EVs and the dated technology they rely on. The effect of technical advancement on secondhand pricing will, however, become less significant as the EV market expands and key technologies mature and stabilize, while EVs will probably depreciate even more slowly because they have fewer parts and endure less wear and tear. The global car sector is about to undergo significant changes. Powertrain electrification, autonomous driving, and the revivification of the mobility sector are having significant effects on the entire industry. These effects extend beyond automakers to include parts suppliers, dealers, retailers, service centers, and other connected sectors of the economy like banking, insurance, and the public sector. Players will face additional difficulties as a result of the industry's transformation, which is also adding to the pressure from growing competition. However, changing their stance and adjusting to these changes will not only enable businesses to maintain their competitiveness, but it will also position them to take advantage of opportunities that are quickly emerging as the new automotive era matures.

References

- Bangkok post. (2022). **What's behind the oil price hike?**. Retrieved from <https://www.bangkokpost.com/business/2261847/whats-behind-the-oil-price-hike->
- Bitner, M. J., & Booms, B. H. (1981). Deregulation and the future of the US travel agent industry. **Journal of Travel Research**, 20(2), 2-7.
- Faiz, A., Weaver, C. S., & Walsh, M. P. (1996). **Air pollution from motor vehicles: standards and technologies for controlling emissions**. World Bank Publications.
- Graff, M. J., Vernooij-Dassen, M. J., Thijssen, M., Dekker, J., Hoefnagels, W. H., & OldeRikkert, M. G. (2007). Effects of community occupational therapy on quality of life, mood, and health status in dementia patients and their caregivers: a randomized controlled trial. **The Journals of Gerontology Series A: Biological Sciences and Medical Sciences**, 62(9), 1002-1009.
- Holland, S. P., Mansur, E. T., Muller, N. Z., & Yates, A. J. (2016). Are there environmental benefits from driving electric vehicles? The importance of local factors. **American Economic Review**, 106(12), 3700-3729. doi:10.1257/aer.20150897.
- Lu, L., Han, X., Li, J., Hua, J., & Ouyang, M. (2013). A review on the key issues for lithium-ion battery management in electric vehicles. **Journal of power sources**, 226, 272-288.
- Nikkei Asia, (2021). China led world with 500,000 electric car exports in 2021. Retrieved from <https://asia.nikkei.com/Spotlight/Electric-cars-in-China/China-led-world-with-500-000-electric-car-exports-in-2021>
- Punch, K. F. (2013). **Introduction to social research: Quantitative and qualitative approaches**. sage.
- Sevier, R. A. (2001). Brand as relevance. **Journal of Marketing for Higher Education**, 10(3), 77-97.
- Silva, C. N. (2010). The e-planning paradigm—Theory, methods and tools: An overview. **Handbook of research on e-planning: ICTs for urban development and monitoring**, 1-14.

The Nation Thailand. (2021). **Electric vehicle registration rises over 42 per cent year on year**. Retrieved from <https://www.nationthailand.com/business/40007926>

Weihrich, H. (1982). The TOWS matrix—A tool for situational analysis. **Long range planning**, 15(2), 54-66.

Yuksel, T., Tamayao, M. A. M., Hendrickson, C., Azevedo, I. M., & Michalek, J. J. (2016). Effect of regional grid mix, driving patterns and climate on the comparative carbon footprint of gasoline and plug-in electric vehicles in the United States. **Environmental Research Letters**, 11(4), 044007.