

A market study of electric two-wheelers in Singapore:

**Exploring market entry of a Swiss Made motorcycle
company**

**Bachelor Project submitted for the degree of
Bachelor of Science HES in International Business Management**

by

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Disclaimer

This report is submitted as part of the final examination requirements of the Haute école de gestion de Genève, for the Bachelor of Science HES-SO in International Business Management. The use of any conclusions or recommendations made in or based upon this report, with no prejudice to their value, engages the responsibility neither of the author, nor the author's mentor, nor the jury members nor the HEG or any of its employees.

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1. Executive Summary

The adoption of electric vehicles is becoming increasingly important in the current context of climate change events in various parts of the world. In the ASEAN countries, this change is becoming more visible over time, particularly in large cities where the population is dense, pollution levels are high, and means of transport such as cars and two-wheelers are the most widely used. Governments are currently responding to these situations through a number of electrical renovation programs involving the construction of electrical infrastructure to meet the needs of these vehicles.

Singapore, or the Lion City, the Dubai or Switzerland of Asia, is characterized by a high population density, a highly open and competitive market, a hub for international trade, and innovative policies regarding traffic congestion and clear air initiatives. This gives rise to many challenges and opportunities for a possible market entry. The electric two-wheel vehicles can respond and solve mobility concerns by providing better mobility thanks to their ecological nature and meeting sustainable goals set by the country. In that sense, the Swiss electric motorcycle manufacturers have opportunities to explore since Singapore is seeking to attract foreign direct investment and has close relations with Switzerland for decades. With high quality production and innovation, Swiss SME motorcycle producer have an interest in internationalizing because of the economic stimulation they can provide. However, a deep comprehension of the Singaporean drivers' needs, the regulatory environment, and the actual competition is necessary in order to choose the right market entry strategy.

The research project focuses on the analysis of the exploration of the two-wheel market in Singapore with the integration of Swiss SMEs manufacturers of electric motorcycles, with a first conceptual understanding of consumer behavior regarding electric vehicles, the internationalization of SMEs, and the strategic market entry possibilities with the description of analytics tools such as SWOT, PESTEL, and Porter's Five Forces, which are useful for identifying the strengths, weaknesses, opportunities, threats, and the overall market environment for Swiss SMEs willing to reach new markets. Secondly, empirical research will focus on the case of Singapore, with an analysis of the trade relations the country has with Switzerland and other countries such as Thailand and the policies the government adopts for their traffic concerns. Then the focus is on the electric two-wheel market, with an analysis of EV infrastructure and a deep analysis of the main actors and their competitive advantages in the Singaporean electric motorcycle market.

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2. Introduction

Rapid technological advancement and environmental consciousness have enabled transportation industry advances. These inventions include electric two-wheelers, which could solve urban mobility and environmental issues. Electric two-wheelers can transform urban mobility in Singapore, which struggles with traffic, pollution, and the demand for sustainable transportation. This report studies electric two-wheelers in Singapore and the possibility for Swiss motorcycle firms to enter this growing market. Singapore, with its advanced infrastructure and strict laws, is moving towards sustainable mobility solutions with their Vision 2040. The city-state's commitment to green transportation and carbon reduction makes it suitable for electric two-wheelers. However, accessing such a market requires extensive knowledge of local culture, consumer preferences, and regulations. This is where Swiss-made motorcycle firms' expertise and quality controls may help. Swiss manufacturers' precision, quality, and innovation could boost Singapore's electric two-wheeler sector.

Traditional gasoline-powered automobiles and two-wheel motorcycles have long caused urban pollution and greenhouse gas emissions. But electric two-wheelers are cleaner, with zero exhaust emissions. They are also economically and environmentally efficient, take up less room than automobiles, and can pass through traffic, making them suitable for highly populated urban areas. In Singapore, where space is limited and traffic is undesirable, electric two-wheelers can be fast and green. Not only are electric two-wheelers environmentally friendly, but they also seem to save fuel and maintenance costs for consumers. They can reduce traffic, increase air quality, and make cities more sustainable. Singapore is an innovative market for Swiss-made motorcycle companies that values quality and performance. As with every market launch, challenges exist.

Singapore is notorious for its strict regulations. Customer needs, infrastructure readiness, and local and worldwide competitiveness must also be considered. This paper, the result of significant research and analysis, covers the Singapore electric two-wheeler market and Swiss motorcycle firms' market integration. The paper analyzes market trends, buyer habits, and regulatory issues to help Swiss manufacturers succeed in Singapore's electric two-wheeler market.

3. Research question

With the emergence of sustainable transportation in Singapore, there are significant opportunities in the electric two-wheeler market for companies looking to expand internationally. However, the main question remains:

How can Swiss electric motorcycle manufacturers enter a market as strict as Singapore's, and how can they add value and drive the electric market forward?

In order to enter a strict regulated market like Singapore's, Swiss electric motorcycle manufacturers need to consider all the challenges that follow:

- What regulations does the Singaporean government have in place? Does they encourage the country's renewable energy electrification?
- What are the opportunities and challenges involved in internationalizing a Swiss electrical motorcycle SME in Singapore?
- How can Swiss electric motorcycle SMEs meet Singaporeans' needs and add value thanks to their "Made in Switzerland" reputation?

4. Research Methodology

To answer the many questions surrounding the study of electric two-wheelers in Singapore with the integration of Swiss electric motorcycle companies, a number of topics have been addressed in order to gain an overview of the market in Singapore. First, a conceptual analysis is carried out around several concepts, such as the different theories explaining the adoption of the electric vehicle, its main adoption factors, and the different adoption profiles.

Then, to understand how to expand into a foreign market, research is carried out on the subject of SME internationalization, using emerging markets as an example. Different theoretical concepts of market analysis are also described. This research comes mainly from articles and academic and scientific works. In the second part, an empirical analysis of the electric motorcycle market in Singapore is carried out, with a brief presentation of the country and its mobility policy, infrastructure projects for electric vehicles, identification of the main players present in the Singapore market, and a description and analysis of the Swiss SME *Kyburz* company.

The company was selected for its ability to meet the market entry requirements, such as products that meet Singapore's mobility environmental social needs and standards. The company is also a well-known SME in Switzerland and has a production line in Bangkok, Thailand, which is a clear advantage for exportation within the ASEAN region of over 600 Mil. inhabitants. Subsequently, primary data acquired through qualitative research, such as questionnaires and interviews, were collected in order to support the data acquired and better guide Swiss SMEs looking to expand overseas.

5. Selected review of scientific knowledge

To better understand the adoption of electric vehicles among consumers, certain theoretical concepts need to be highlighted, such as how a new technology or innovation can be integrated for consumers. In Singapore, these concepts can be used to help us understand the integration of electric two-wheelers by the population that uses EVs on a daily basis.

5.1. Technology Acceptance Model (TAM)

The first concept is the technological acceptance model, which includes several motivational and external variables. Among the motivational variables, the most important are perceived usefulness and perceived ease of use, which respectively conceptualize the degree to which a person using this technology could improve their performance at work and the degree to which a person using this technology could do so effortlessly. Other variables, such as attitudes towards technology or behavioral intention, can be mentioned with regard to external variables, such as the subjective norm, which defines the opinion of people important to the user concerning the behavior to adopt towards this technology (Siddiq and al., 2018).

5.2. Diffusion of Innovation theory

The second theory is the Diffusion of Innovation created in 1962 by E.M. Rogers, which is an old theory of the social sciences. It basically describes how new products or ideas are adopted by a certain population. It originated in communication but is applied in many different domains such as agriculture, social work, public health, and marketing. The term “adoption” refers to the action of doing something in a different way than before, replacing previous practices (Leif, 2022).

Adoption does not happen at the same time for everyone in a social system. Some people may have a slower pace for adopting a certain product than others, and therefore each has different characteristics that help understand the adoption of an innovation. As in Figure 1, there are five types of categories identified for the different approaches to adoption: innovators, early adopters, early majority, late majority, and laggards. The majority lies between the early majority and the late majority, according to the diffusion of innovation theory (Leif, 2022).

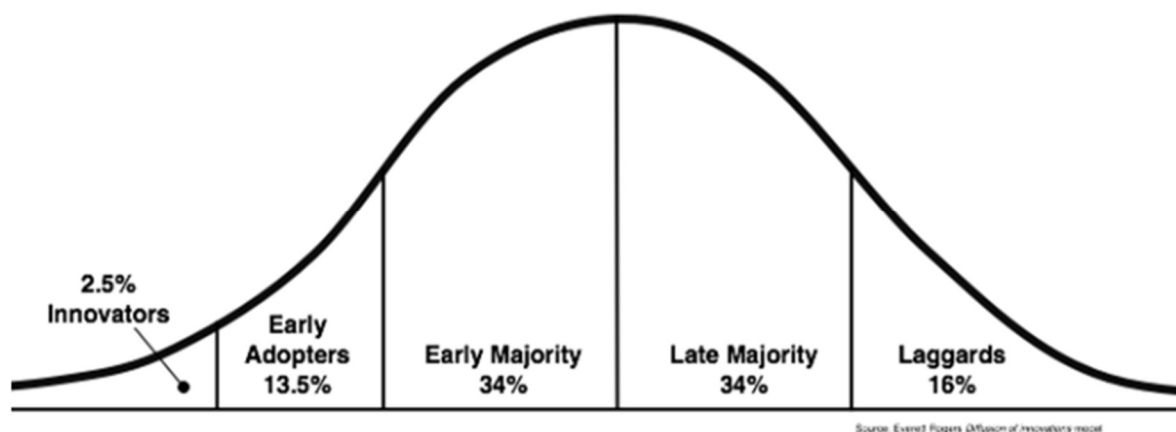


Figure 1 Diffusion of Innovation Theory

Source : (Leif, 2022)

The innovators are the ones who are willing to adopt the fastest. They want to test, for example, a new product as soon as it is available by taking the costs associated with it. They are often the ones that lead to the development of new ideas. To attract this category, only a little change in innovation is sufficient. The early adopters are also willing to adopt new ideas but are more opinion leaders and appreciate taking on leadership roles. No information is needed to convince them since they embrace change. The early majority are not necessarily made of leaders but are willing to adopt innovation before the average person. However, in order to adopt, they need sufficient knowledge and proof that the new idea is giving the expected benefits and is working. The late majority is, however, less likely to adopt new ideas. They are skeptical and will only accept the change if the majority of the population has already tried it. Therefore, to attract this category, evidence of how many people positively experienced the adoption is important. Finally, the laggards are the most difficult people to convince to change since they rely on their traditions and are very conservative. There are different strategies to use for this category of people, including the pressure of other people in other categories (Leif, 2022).

There are also different stages at which a person decides to adopt a new idea or innovation. At first, they will be aware of the innovation may respond to needs. Then there is the decision of whether to reject or accept the innovation. Finally, the initial use and continued use of the innovation. However, during these stages, five different factors can influence adoption: relative advantage, compatibility, complexity, trialability, and observability (Leif, 2022).

Relative advantage refers to how a new product, idea, or innovation is better than the old one it replaces. Compatibility is the understanding of the innovation's compatibility with the

adopter's values and needs. Complexity refers to the difficulty for a person to understand the use of innovation or an idea. Triability is the extent to which innovation is tested before adoption is made, and observability is the tangible results that innovation provides (Leif, 2022).

5.3. Electric Vehicle (EV) Adoption Factors

The use of an electric vehicle changes drastically compared with a combustion vehicle, both in terms of the driving experience and the economic costs involved. To go into more detail, a number of studies have been carried out that show the factors influencing the adoption of an electric vehicle. The studies are more focused on electric cars, but this approach can also be applied to two-wheelers, which ultimately share the same principle of getting from point A to point B.

A study by Valerian Geny shows that for an optimal transition to the EV system, it is important to understand the key criteria driving the adoption of these electric vehicles. These points are crucial both for companies wishing to establish a sales strategy and for governments wishing to invest in infrastructure projects to meet greenhouse gas emission targets. First of all, it is complex to measure adoption in general terms without going into detail. For example, to find out why adoption is faster in New Zealand than in Australia, geographical reasons alone are not enough. Factors such as education, average income, and the availability of infrastructure need to be taken into account. These criteria are quantifiable and therefore easier to compare across countries. But there are also qualitative criteria that are more specific to certain regions (Geny, 2021).

In figure 2, a first classification consists of sorting the criteria according to three main factors: demography, general situation, and psychology (Geny, 2021).

Demographic factors	Individual factors	gender, age, education level, income and occupation
	Family factors	number of vehicles, accessibility to plug-in vehicle
Situational factors	Technical features	driving range, high range preference, charging problem
	Cost	Front cost, operational cost
	Environmental attributes	GHG emission, environmental impact
	Government policy	Financial subsidies, tax credit, free parking, driving privilege (HOV)
Psychological factors	Experience	BEV knowledge, BEV driving experience
	Attitudes	Like or dislike
	Emotions	Visceral, behavioral, reflective

Figure 2 Factors Classification of Adoption

Source : (Geny, 2021)

Secondly, in Figure 3, a study by Chen et al. demonstrates the links between several factors influencing adoption. This is a model created from an empirical study carried out in the Nordic countries, based on 4,885 participants, which led to the creation of the Multinational Conceptual Framework for EV Adoption, comprising four main factors: socio-demographics, technical factors, economic factors, and behavioral factors (Chen, 2020).

The socio-demographic factors regroup criteria such as income, gender, age, number of children, rural or non-rural people, and the country they belong to. Then the economic factors encompass many financial criteria that are directly attributed to people's adoption of EVs, such as their intention to buy an EV vehicle, the cost of purchase, and the time it takes to purchase an EV car in the next 5 years. The technical factors are divided into two groups: car performance, such as ease of operation, reliability, speed, design style, and fuel economy; and electric mobility, including charging availability, driving range, charging time, battery life, and vehicle-to-grid capability. Finally, the behavioral factors are also divided into two groups: mobility practices and sustainability values (Chen, 2020).

According to the study, mobility practices have interconnected relationships between income, number of cars, driving distance, and range. A family that owns multiple cars is more likely to purchase EVs at a higher price since they have a higher income. However, higher income, according to the study, is correlated with higher mileage, and thus a person could travel more distance than the range that the EV offers. Therefore, a conventional vehicle can replace the EV. In addition, the experience a person gets on an EV can increase or decrease depending on how long the vehicle is driven. According to their experience, the more a person is exposed to EVs, the more willing they are to purchase one. The more a person uses the EV, the more

they develop an affinity for it and develop higher consciousness and knowledge about this way of driving (Chen, 2020).

Finally, the sustainability values incorporate criteria such as acceptance of innovation related to sustainability, such as solar panels, environmental values, an increase in recycling, and energy efficiency applications. There are demonstrations that show that positive effects can happen when combining several behaviors with products, such as the adoption of EVs and environmental consciousness. Additionally, there is a correlation between the adoption of EV and the environmental risk reductions. Therefore, attitudes towards EV adoption are strongly influenced by environmental performance rather than price or range (Chen, 2020).

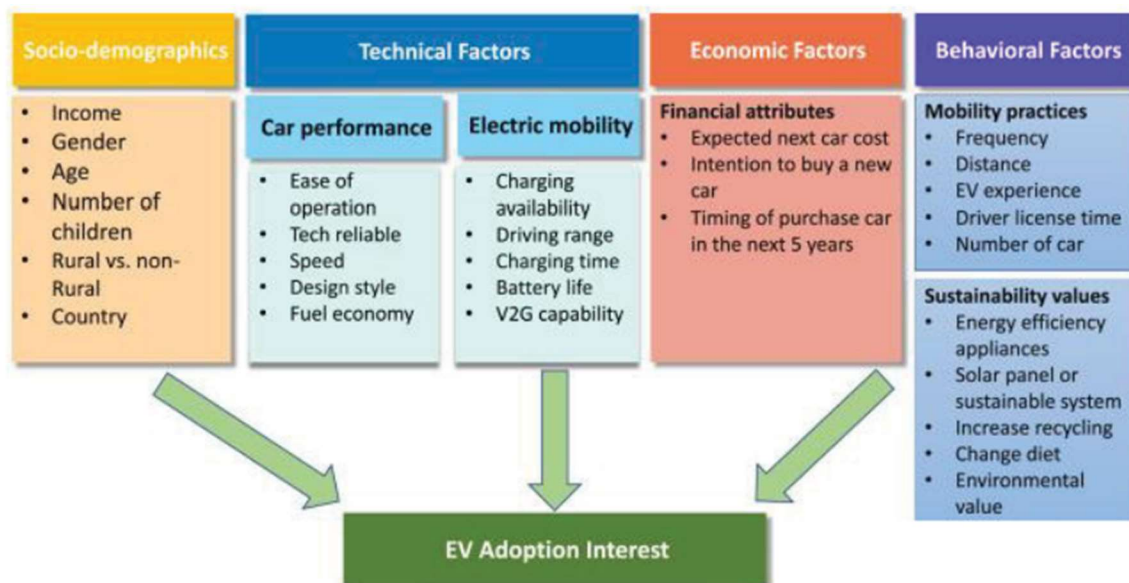


Figure 3 Multidimensional conceptual framework for EV adoption

Source : (Chen, 2020)

5.4. Internationalization of SMEs

Secondly, understanding the very concept of internationalization may seem vague or simplistic. It is therefore appropriate to show how an SME producing electric motorcycles can enter an unfamiliar market, and what the stakes are, as well as the benefits that can be derived from exporting outside the company's sector of activity.

The internationalization of small and medium-sized enterprises corresponds to activities linked to export, import, or foreign direct investment, such as outsourcing or international subcontracting. These activities are closely linked to foreign organizations or partners with whom there is an exchange of services, including information on markets that concern the business sector that wishes to internationalize (Interreg Europe, 2021). Small and medium-

sized enterprises correspond to businesses with between 10 and 49 employees for small enterprises with an annual turnover of less than 10 million euros and between 50 and 250 employees with less than 50 million euros annual turnover for medium-sized enterprises (European Commission, 2005).

The internationalization process of SMEs can be different depending on the context in which the firm wants to internationalize, including its own identity, their country of operation, and their targeted foreign countries. Indeed, SMEs, which are smaller than multinational companies, often face a lack of financial resources and therefore need external services provided by many associations thanks to networks. The inputs they will receive will enable the SMEs to better understand the cultural environment of their target country and its institutional conditions (Child, 2022).

A study published in the Journal of Innovation Economics and Management highlights the importance of SMEs' internationalization as a source of job creation and growth. In industrialized economies, they represent the majority of companies, and regarding internationalization, SMEs are unique on their own and are therefore studied individually. The article also describes several theories to explain SMEs' internationalization. They include, firstly, the economic approach, in which factors such as financial constraints, resource availability, and management skills can influence these companies' activities. Secondly, the stages approach describes internationalization as a number of different stages in which a company will learn and gradually expand its activities. The Uppsala model is a framework that links learning, expansion, and innovation for SMEs when internationalizing (Laghzaoui, 2011).

An article published in IESE's Alumni Magazine shows that a proactive approach to internationalizing SMEs can make them more successful, which allows them to have much greater access to clients and expand their activities. There are reactive reasons for internationalizing, such as sales increases, activity diversification, direct communication with clients, and labor cost reduction. There are also proactive reasons, which include market growth capitalization, outsourcing, obtaining information on clients, competitors, and local cultural diversity. They suggest that every SME should incorporate a competitive strategy focused on internationalization that incorporates economies of scale, competitive advantage, market selection, and the right structure for their international activities. The SMEs should also be aware of the specific regulatory requirements which may lead to a heavy administrative burden, to differences such as the cultural, language backgrounds, and the ways of consumption. Therefore, internationalizing requires time, flexibility, planning, and patience (Ricard and Llopis, 2014).

5.4.1. Emerging markets

Emerging markets are a major topic of discussion in international economic debates because they are frequently related to economies that are experiencing rapid growth and modernization. These markets stand out because they experienced increased economic liberalization and reforms as they made the shift from closed economies to open market economies. They are frequently recognized for their rapid economic growth, growing importance in the world economy, and acceptance of free-market ideas. The International Monetary Fund (IMF) has identified 40 economies considered to be emerging markets according to their higher incomes (DUTTAGUPTA and PAZARBASIOGLU, 2021).

However, World Economics did identify 24 nations that collectively make up the emerging markets, which account for 50% of the global GDP and 66% of the growth in that GDP over the last ten years (2012–2022). Over 4.3 billion people live in these countries, with an average life expectancy of 75 years and a median age that is currently 34 as opposed to the global average of 30 (World Economics, 2022). In 2021, the combined gross domestic product (GDP) of developing and emerging markets by Aaron O'Neil in Statista will be around 39.69 trillion dollars (Statista, 2023).

We can first identify the BRICS, which are made up of Brazil, Russia (which World Economics does not include), India, China, and South Africa. Except for Russia and Brazil, the BRICS have seen considerable economic growth and a rise in their worldwide status. But they also have to deal with particular difficulties like regulating inflation, sustaining sustainable growth, and resolving geopolitical problems. (Wolf, 2023).

These rising markets' growth is significantly influenced by the expansion of the middle class in those countries. From barely 507 million in 2000, the global middle class—defined as persons with assets between \$10'000 and \$100'000—had more than tripled to 1.7 billion by mid-2020. The middle class is anticipated to continue to grow, possibly at a greater rate than at any previous point in history, in the coming decade (Chris Versace et al., 2021). With a 500 million population growth rate, Asia could be the region to notice this expansion the most (Kharas, 2017). The rise of the middle class, according to Donmaz, Havayollari, Bölümü, and Sayil, improves living standards and consumer power. The middle class is the foundation of both the economy and the market in a nation where economic factors predominate (Emine Mediha Sayil et al., 2017).

Foreign direct investment (FDI) is essential for these economies' economic development since it brings in new capital, boosts their competitiveness, transfers knowledge, and increases

economic growth (Al-Kasasbeh et al., 2022). These economies do, however, also include significant informal sectors, which are activities that generate market value but are not registered. According to the International Labor Organization, there is an estimation of 2 billion people in 2021 working in the informal sector, which represents 60% of the world's total workforce. This phenomenon makes it difficult to regulate and maintain economic stability (IMF, 2021).

5.4.2. Market Entry Strategies

In order to understand the process involved in internationalizing a company, a number of studies show what strategies need to be adopted in order to enter a market with all the tools at companies' disposal. It is crucial to have a thorough understanding of the target market's characteristics, potential, and structure when formulating a market entry strategy (KPMG, 2011). The entry method itself comes in a variety of shapes. The simplest strategy is exporting, which is selling domestically produced goods abroad. Alternatively, a foreign firm may use a brand name, technology, or product specifications through licensing or franchising. Access to resources or capabilities may be made possible by a partnership or strategic alliance with a local business. Last but not least, acquisition or "greenfield investment" means buying an already-existing business or starting a new one in a foreign market (KPMG, 2011).

The approach should be implemented in stages, starting with a pilot phase, moving on to a roll-out phase, and then a review phase. The identification of possible risks, the evaluation of their consequences, and the creation of mitigation plans are all essential components of risk management in this process. The plan should also be periodically evaluated and modified to reflect shifting market conditions (KPMG, 2011).

In the process of international business development, a company's involvement becomes not only a condition for profit increase but also for its existence (Dinu, 2018). The strategic options for entering foreign markets are categorized based on the degree of involvement, degree of control, presumed risk, and profit. These strategies include direct export, where the manufacturer establishes direct relations with the external customer, and indirect export, where the manufacturer sells to an intermediary, which in turn trades the products to customers or importing traders (Dinu, 2018).

The search for development opportunities through market diversification, the potential of international markets, and the capacity to develop economies of scale in production, sourcing marketing, and research and development are some of the factors that influence the decision of a strategic option for new market entry (Dinu, 2018).

Sprinkler, waterfall, wave, and digital market entry are the four main methods for entering international markets, according to Sapozhnykov. The waterfall strategy involves entering one international market at a time and using the expertise and knowledge obtained there before moving on to the next. Businesses with fully developed goods with a long life cycle should use this technique. On the other side, the wave method entails combining related markets and entering them all at once. This plan offers a variety of revenue streams and experience doing business abroad. However, it necessitates a more thorough market study and grouping, which may result in mistakes. For internet enterprises, the digital market entry strategy is appropriate. It includes carrying out an online study, formulating a step-by-step plan, building a website or mobile app, and implementing digital advertising. Businesses can use this tactic to assess the market for their products without making substantial upfront expenses. Market research, customer experience, analytics tracking, and execution are just a few of the processes involved in putting these strategies into practice (Sapozhnykov, 2021).

When developing a foreign market entry strategy, Michalski underlines the significance of comprehending the foreign environment, firm capacity, and marketing mix activities. The consistency of a comparison between the domestic and international environments guides the methodology. Different types of foreign trade are described by the author, including casual export, agency agreements, partnerships, licensing, joint ventures, franchising, and totally owned subsidiaries. The author also emphasizes that the most successful companies are those that understand how to precisely evaluate client demands and incorporate the results into their plans (Michalski, 2015).

Starting from this, it is therefore also necessary to take into account the tools available to enable a company to know what its strengths and weaknesses are and the environment in which it is preparing to explore. There are various ways of analyzing this kind of thing, including the best-known SWOT, PESTEL, and Porter's five forces.

5.4.3. SWOT

SWOT, which stands for Strength, Weakness, Opportunity, and Threat as in Figure 4 (Renault Val, 2023), is a widely used strategic tool for assessing a company's capabilities in a competitive world and for developing strategic planning. It is used to analyze a company's strengths and weaknesses, as well as the external factors that influence its decisions (Will Kenton, 2023). Some factors cannot be controlled, and some can. However, when these factors are identified, it is up to the company to act



Figure 4 SWOT

Source : (Shewan, 2022)

accordingly (MindTools, 2023). This is precisely designated so as to have a realistic overview, based on data and facts. Companies must use it wisely, and not as a prescription, because the environment around them is constantly changing (Will Kenton, 2023). SWOT also helps to protect against competitors by analyzing which weaknesses are potentially exploitable. It can also be used to uncover previously unseen opportunities and thus compensate for the weaknesses analyzed (MindTools, 2023). This analysis must be carried out regularly so that the company's performance is constantly assured. This will enable the company to question its strategic plans, keep up with demand, and stand out from the competition. This strategic analysis was developed by Albert Humphrey, who was at the Stanford Research Institute in the 1960s, during a study into why business planning fails (Schooley, 2023).

To organize this SWOT analysis, it is divided into a "grid-like matrix" in which there are four main points in groups of two representing the elements mentioned above. The first group, the internal factors, is made up of the company's strengths and weaknesses, and the second group, the external factors, is made up of opportunities and threats.

5.4.3.1. Strengths

Strengths consist in what the company does best, in the expertise it possesses and which is unique, in the possession of a unique technology that no one else has and having a copyright or patent on it (Schooley, 2023), or in the quality of the product or service that differentiates it from the competition (Dan Shewan, 2022). This analysis of strengths should make it possible to identify "the unique selling proposition" (MindTools, 2023).

5.4.3.2. Weaknesses

Weaknesses are warning signs that a company needs to be aware of in order to avoid going out of business (Kenton, 2023). Weaknesses are intrinsic characteristics of a company. It is important to know how customers perceive the company and why the competition is doing better by being as honest and realistic as possible (MindTools, 2023). Indications such as low consumer satisfaction or low product quality are signs of weakness (Lindley, 2023).

5.4.3.3. Opportunities

Opportunities refer to external factors that allow a company to benefit and gain value. For example, a company that has the opportunity and capacity to expand into other markets abroad to gain market share (Kenton, 2023). In other words, there are opportunities for something positive to happen for the organization, but the company has to act to make it happen. Not only does this allow the organization to stand out from the crowd, but it can also lead a market if the opportunity arises. Even small changes that can turn into opportunities are important to consider (MindTools, 2023). Elements such as growing demand for a product, a new segment, a new partnership, the discovery of a new technology (Lindley, 2023), and the low presence of competitors are indications of opportunities.

5.4.3.4. Threats

Threats are also external factors that have the potential to threaten a company's activities. Unlike opportunities, in this case, factors such as rising manufacturing costs or increased competitiveness are threats to a company (Kenton, 2023). It is therefore important to be aware of these so as to anticipate and react proactively to these threats and not become a victim. When selling a product, standards can change at any time, so it's important to adjust the product to the right specifications. Other signals, such as cash-flow problems or growing debts (MindTools, 2023) and the resulting drop in demand (Lindley, 2023), are also threats that need to be taken into account.

5.4.4. PESTEL

The second tool is also used a lot; it was created by the American Francis Aguilar more than 50 years ago. It stands for Political, Economic, Sociological, Technological, Environmental and Legal as in Figure 5 (Peterdy, 2022). Basically, it was created to help companies with long-term activities understand that the world around them is



Figure 5 PESTEL

Source : (Peterdy, 2022)

changing, and that change must therefore be accepted. This is why the terms mentioned above are external factors that influence a company. So, by not analyzing these factors, a company can suffer the consequences (Reding, 2021).

This type of analysis can be used, for example, in marketing initiatives, to gain an overview of the situation in a constantly evolving market. This type of analysis can also be used by companies wishing to break into new markets to differentiate themselves from the competition. This tool can also provide other advantages, such as the identification of potential threats or opportunities as mentioned in SWOT, but it can also have disadvantages, such as the criticism that the simplicity of the model is not comprehensive and not adapted to all types of environments and that it is based solely on external factors (Red, 2016).

5.4.4.1. Political

The politics, or more precisely, the policies that the government launches, can change, damage, and influence a company (Reding, 2021). For example, a multinational that closes several of its subsidiaries to relocate elsewhere where there has been a tax cut (Peterdy, 2022). Other examples of political factors that can influence a company include trade and fiscal policies (Red, 2016). Upcoming elections can also change a company's management directly as a country becomes more right- or left-leaning, depending on the circumstances (Peterdy, 2022).

5.4.4.2. Economic

Economic factors have direct impacts on an organization, notably on their performance and, therefore, on their profits (Red, 2016). Purchasing power is just one of many external economic factors that can have an impact on management decisions. Greater purchasing power is good for the company, and conversely, lower purchasing power has a negative impact (Deuwel, 2023). Other indicators such as inflation, exchange rates, interest rates, minimum wages, and unemployment rates are also taken into account (Reding, 2021).

5.4.4.3. Sociological

These factors are less obvious to evaluate than economic ones, as it is more difficult to assess social behaviors, such as anticipating the degree of leisure that has an economic impact on a company. Being a more neglected factor, it nevertheless has a way of making an entire industry tremble. For example, over time, companies have included lifestyle or health-oriented trends (Peterdy, 2022). Rising population rates, health, safety, and consumer awareness are all drivers (Reding, 2021). For example, a company needs to ensure that the average age in a country is not too high before selling children's products (Deuwel, 2023).

5.4.4.4. Technological

Technology-driven innovation also has a significant impact on a company's transformation, requiring it to adapt quickly (Reding, 2021). Factors such as automation, R&D, and digitization are subject to this constant change, to which firms must adapt. However, it's also worth taking into account other neglected factors, such as innovative methods in terms of logistics, manufacturing, and distribution (Red, 2016). Traditional businesses, for example, are more negatively affected by technological change due to their difficulty adapting (Peterdy, 2022). The same applies to analyzing competitors who file patents and who may therefore be a threat to a company that does not have the same capabilities (Deuwel, 2023).

5.4.4.5. Environmental

Environmental factors have emerged more recently with the evolution of ecological awareness due to climate change, carbon emissions, production, and distribution methods (Reding, 2021). In addition to this, the concept of Corporate Social Responsibility has become an increasingly important topic of study, to the point where companies are being asked to include it throughout their activities (Red, 2016). A good example is the requirement for companies listed on the stock exchange to report data relating to the greenhouse gas emissions of the activities they undertake (Peterdy, 2022).

5.4.4.6. Legal

Legal factors are related to any type of legal change that requires new standards when selling a product or service (Reding, 2021). Companies need to understand what the legal standards and requirements are when they decide to discover new markets (Barrington Red, 2016). For example, the introduction of a law banning electric scooters from sidewalks had a negative impact on the sector (Deuwel, 2023). It is therefore important to know how an industry is regulated in a market, whether a license is required to operate, and whether there is any intellectual property protection (Peterdy, 2022).

5.4.5. Porter's Five Forces

Porter's Five Forces is a tool for assessing the competitive environment and identifying a company's strengths and weaknesses as in Figure 6. It can then be used to establish a business strategy to prepare for market entry. The name comes directly from Professor Michael E. Porter of Harvard Business School in 1979. More precisely, it will enable us to determine the intensity of competition, profitability, and attractiveness of a market (Scott et al., 2023).

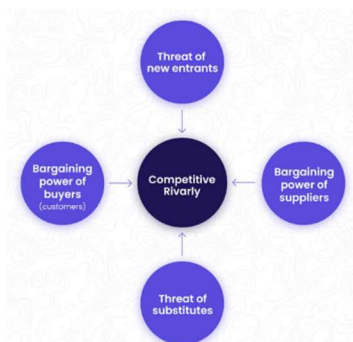


Figure 6 Porter's Five Forces

Source : (Tefi, 2023)

"A healthy industry structure should be as much a competitive concern to strategists as their company's own position." (Michael E. Porter, Harvard Business Review, 2008).

The main advantage of this tool is that it enables a company to see what is most profitable and to identify potential threats. The disadvantage is that the level of research and analysis is very substantial (Tefi, 2023).

5.4.5.1. Competitive rivalry

Competitive rivalry refers to the number of competitors in a market and their ability to stand out from the rest. The more competition and the more products and services in a market, the less power a company has. In this case, prices are the lowest to attract the largest demand. Conversely, with a low level of competition, a company can monopolize the market and raise its price at will (Scott et al., 2023). Competition is aggressive when exit barriers are high, competition is equal in size and position, or there is a tendency to cut prices due to high fixed costs (Harvard Business School, no date).

5.4.5.2. The bargaining power of suppliers

The next criteria is the power that suppliers have over companies. This may come from the fact that suppliers have raw materials of unique quality and therefore more power to decide on price. Companies purchasing these raw materials can therefore become dependent on them. The fewer suppliers a company has, the less likely it is to change suppliers (Scoot et al.).

5.4.5.3. The bargaining power of customers

Customer power is defined by how many customers a company has, how important they are, and how much it would cost a company to look for customers in new markets. A low number of customers means they have more power to negotiate the purchase price. By contrast, the more customers there are, the less important they are to the company, and therefore the more it can potentially raise the price at its convenience (Scoot et al.). Consumers also find it easier to switch brands if there are many sellers, going straight to the cheapest (Marci, 2023).

5.4.5.4. The threat of new entrants

The market entry of new competitors can be a threat to a company already based in the market if the competitor has had less cost and time to penetrate the market. It is therefore important for an industry to have barriers to market access in order to reassure established companies, so that they can better decide on prices, for example (Scoot et al.). Barriers to entry include

access to raw materials, cost advantages, a good brand image, and economies of scale (Marci, 2023). New entrants may still have many difficulties entering the market, such as access to unique, affordable distribution channels. The government may also play a role in entry barriers, such as access to subsidies that would encourage companies to invest or licenses that would limit access (Tefi, 2023).

5.4.5.5. *The threat of substitute products or services*

Substitute products are also a threat if one or more competitors decide to cut prices by reducing costs, therefore damaging a company's sales and reducing its market share. Customers will consequently switch to a cheaper product (Scoot, 2023). This analysis will nevertheless serve to identify and anticipate competitors' actions in order to act accordingly (Marci, 2023). For example, the emergence of messaging applications is a substitute for e-mail (Tefi, 2023).

5.1. Conceptual Model of EV Ecosystems with the case of empirical research of Indonesia

Another study by Triyono Widi Sasongko et al. explains the “Conceptual Model of EV Ecosystems and Relationships Between Sub-Systems” in Figure 7, based on an empirical study in the case of Indonesia. It goes beyond the factors of adoption as seen previously by taking into account the relationship between the ecosystem and the adoption of EVs. The EV manufacturer, which is the one producing the vehicles, will determine the number of vehicles produced largely by market incentives, government policy, and demand. They influence on their side rational factors such as range, performance, type, and capacity, purchase price, total cost of ownership, and psychology-social factors such as the EV number effect, the promotion effect, the word of mouth effect, and environmental awareness. The government's relationship is directly linked to their policies related to sustainable objectives, infrastructure investment, and the promotion of sustainable mobility. Government support is very important when it comes to converting to electric vehicles because they are the ones who are going to provide the subsidies and incentives for the other pillars of the ecosystem. The more charging stations there are for electric vehicles, the greater the incentive to convert to them. It should be noted, however, that the implications of implementing these policies must be carefully studied so as not to disrupt the gasoline car industry and subsequently the social and economic indicators (Sasongko, 2022).

Regarding psychological-social factors, they are more qualitative factors that contribute to the purchase of EVs. The EV number effect is described as a potential new purchase thanks to the increase in quantities of this type of vehicle on the road. Promotional effects are the main

channel of influence through social media used by the government but also by non-governmental organizations. Word of mouth is present in all social places where there are direct contacts between people, including the workplace, public transport, and with friends and family. Environmental awareness is also important since EVs are zero-emissions promoters (Sasongko, 2022).

The factors that affect the implementation of EV infrastructure are linked to government policies. The more initiatives a country puts in place for infrastructure development, the more charging points there will be to guarantee a pleasant EV experience for users (Sasongko, 2022). According to the study by Liang, there is a strong relationship between the number of EV vehicles on the roads and the number of charging points available (Liang, 2022).

Finally, the factors that affect the manufacturers in producing the EVs are mainly related to or influenced by government policies on reducing dependence on fossil energy sources and gas emissions. The development of electrical mobility is also attached to the long-term market share objectives (Sasongko, 2022).

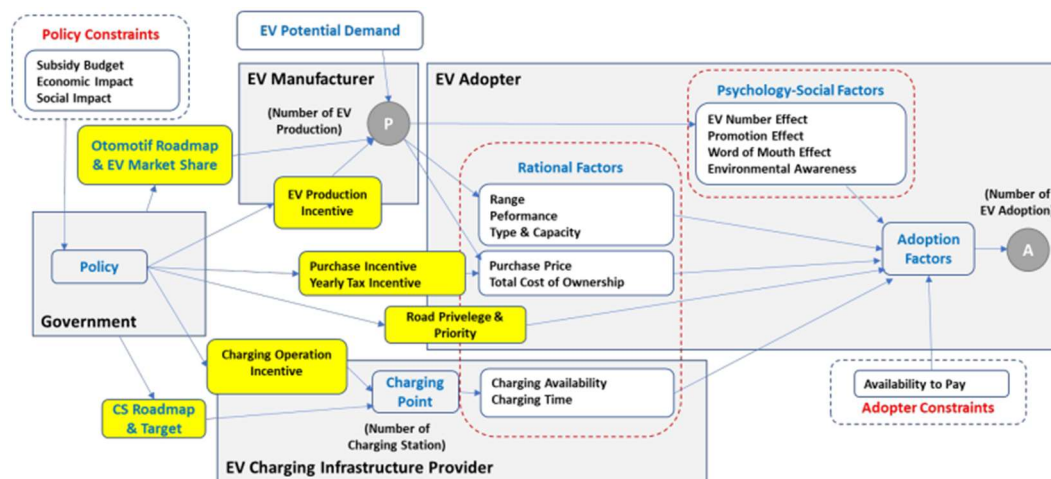


Figure 7 Conceptual Model of EV Ecosystems and Relationships Between Sub-Systems

Source : (Sasongko, 2022)

5.2. Environmental Impact of Transportation

Dr. Jean-Paul Rodrigue mentioned that the transports, as well as the infrastructure, contribute to environmental impacts with the emissions of gases affecting the atmosphere. The challenge is to measure each type of transport contribution and its scale of impact. In total, the transportation sector accounts for 22% of global CO₂. There are different levels of impacts, such as direct, indirect, and cumulative ones. The carbon monoxide and the noise are impacts that are described as direct since they are well identified. The impacts that we don't see or

notice, such as the particulates affecting the human body, are indirect. Cumulative impacts are those that include both direct and indirect impacts that are multiplied and provoke a major consequence, such as climate change (Dr. Rodrigue, 2020).

According to Providence Amaechi, the transportation sector has been linked to the environment since the start of the fuel combustion engine and its globalization around the world. With the methane, nitrous oxide, carbon dioxide, and halocarbons rejected by the vehicles, especially in concentrated areas, many eco-factors are affected, such as air quality, noise, water quality, and biodiversity. One of the transportation types that affects these factors the most is maritime transport because of the increase in demand for shipped products and their consumption (Amaechi, 2022).

Another previous study states that congestion in cities is also a major factor in pollution. It does not necessarily come from the high production of fuel-powered vehicles, but from the growing population in megacities, which is responsible for 80% to 90% of pollution in the atmosphere. They take the example of Shanghai, where their vehicles contribute almost 87% of CO₂, 97% of hydrocarbons, and 74% of nitrogen oxides (Annual Reviews, 2011).

5.2.1. Fuel motorcycle industry

The motorcycle industry must be considered when speaking of environmental impacts. In 2008, Chuck Squatriglia published an article regarding the motorcycle's pollution, and it appears that despite rejecting less CO₂, motorcycles emit more carbon monoxide and hydrocarbons than cars (Squatriglia, 2008). However, with the introduction of the Euro 4 emission standards in 2017 and Euro 5 in 2020, the manufacturers were required to develop motors, which implies bigger and more efficient catalytic converters to reduce air pollutants. Euro 5 is changing the standards drastically with an obligation to reject no more than 1.00 g per km of carbon monoxide, 0.100 g per km of hydrocarbons, 0.068 g per km, and 0.060 g per km, and the durability of these emission standards extends to the lifetime of the motorcycle, compared to after 20'000 km in Euro 4. These standards were initially for the EU, but they became the standards at the international level (Chung, 2019).

5.2.2. Electric motorcycle industry

On the side of electric motorcycles, there are many questions regarding the benefits of producing these types of motorcycles. On one side, an electric-powered motorcycle is said to be less polluting, not only because of fewer gas emissions but also because of their production. The parts of an electric car are simpler to assemble, and there are fewer parts to produce,

such as the clutch or gearbox, which therefore requires fewer raw materials (Ayu, 2022). Moreover, research done in Uganda comparing the environmental impact of two types of motorcycles, the electric and gasoline engines, shows that there is a reduction of 97% of CO₂ when switching to the electric ones (University of Michigan Library, 2021). In Singapore, an experiment has been done between the electric and gasoline models of the *Honda CBR400RR*. It is the same bike, but one is converted at the same time as the fuel one is produced. Each component of conversion is evaluated from extraction to the end of the life of the raw materials. As a result, even if converting a motorcycle into a battery-powered engine requires consuming energy, the moment of usage of the product compensates by far the costs of conversion. Moreover, in comparison, for a fuel engine when used, the total fuel consumed is responsible for 72% of the total operational lifetime (EVS27, 2013).

6. EMPIRICAL RESEARCH: EXPLORING THE CASE OF SINGAPORE

In order to get a better overview of a market, some fundamentals are described to make sure that the electric two-wheeler market in Singapore can be analyzed, such as whether the government is promoting or restricting the electric market, or if Singapore and Switzerland enjoy good trade relations. In addition, the relation between Singapore and Thailand is described since the Swiss company *Kyburz* has a production hub in Bangkok. Then, with the analysis of the electric motorcycle market, the adoption of EVs by the Singaporean population and the introduction of an example of a Swiss company with the potential to enter the Singaporean market, the information received will enable a better visualization of the electric two-wheeler market in Singapore to be gained from the concepts previously described, such as SWOT, PESTEL and Porter's Five Forces.

The country of Singapore is chosen due to their abundant information regarding their green initiatives policies and recent information regarding the EV market. Secondly, as a city-state, its small size territory enable the possibility to test the expansion of more sustainable mobility.

6.1. City-states

a city-state, or more precisely a sovereign state, is a country that contains only one city and is entirely autonomous. In the old days, city-states were Athen, Sparta or Rome. Today, fully independent city-states include Singapore, Vatican City and Monaco. Hong Kong and Dubai are also autonomous cities, but part of larger nations (Stucki, 2020). These cities are

A market study of electric two-wheelers in Singapore: Exploring market entry of a Swiss Made motorcycle company

characterized not only by their small size, but also by their population density. Monaco, for example, is the world's second-smallest city-state, but has the world's densest population. Singapore is ranked second in terms of population density, has its own currency following its separation from Malaysia and, like Monaco, has its own military (Longley, 2019).

6.2. Singapore : the Switzerland of Asia

Singapore, the "Lion City," is often compared to a city, a country, and a state. It is one of the smallest countries in the world, with a total area of around 712 square kilometers, almost as big as Jakarta in Indonesia (MapFight, 2023). The population of Singapore amounts to roughly five million; it is indeed dense for such a small territory. In Singapore, the population is multicultural and diverse, regrouping four main communities. They are composed mostly of Chinese people but also of Malays, Eurasians, and Indians. This multiculturalism, which can be seen everywhere, from streets to foods, languages, and festivals, is what defines the uniqueness of the country (Ministry of Foreign Affairs, 2023).

Singapore's development into a global city has been helped by its geographical location, in the most southwest point of the Malay Peninsula. This makes them a commerce hub where trade flourishes and is accessible. Between Malaysia and Singapore, there are the Straits of Johor, which is a natural border where many ships pass through every day. (Ministry of Foreign Affairs, 2023)

It is also a member of the so called Association of Southeast Asian Nations (ASEAN), of the Asia-Pacific Economic Cooperation (APEC), and of the Trans-Pacific Partnership (TPP) (Michigan State University, 2023). Despite its small size, Singapore has a strong economy, good governance, and effective infrastructure. (Ministry of Foreign Affairs, 2023)

Singapore has a highly developed economy. The GDP per capita in 2017 was \$54'530 (World Bank, 2019). The nation's high income per capita demonstrates its outstanding economic success and can be attributed to its advantageous position, gifted workforce, and advanced infrastructure. The nation's economy benefits from a regulatory framework that is business-friendly. The Singaporean government encourages corporate flexibility and entrepreneurship. These include clear and effective regulations, robust protection for property rights, and moderate, predictable taxes. These policies have promoted both local business expansion and foreign investment (EDB government, 2023).

Singapore is highly competitive on the world stage. It is competitive due to its open economy for commerce and first-rate infrastructure (Goh, 2023). Its legal system is based on a

parliamentary system of government, which comes from an advanced version of the old English legal system (Ministry of Law, 2018). The workforce of the nation is highly competent and adaptable, which has raised its competitiveness (Goh, 2023). Singapore has developed strong competencies and high productivity in these areas thanks to its strategic concentration on finance, technology, manufacturing, and logistics. Singapore's strategic focus and capacity to draw in and keep people from around the world have allowed it to lead the world economy. (EDB government, 2023)

Singapore is also known for being an export-driven country since its separation from Malaysia and its independence in August 1965. Indeed, with its small domestic market, it lack resources and therefore encourages foreign direct investment since their separation with Malaysia. This change in trade policy increased their growth rate by 10% from 1965 to 1979. In 2005, the island had the highest GDP ratio in the world, with 360% of GDP in terms of trade in goods and services (Liang, 2005). In 2023, it is ranked fourth among the world's most competitive economies (Xuan, 2023). This shows how important free trade agreements are for the country. During the Asian Financial Crisis in 1997 and 1998, Singapore was able to recover faster than its neighbors because of its trade liberalization. Singapore signed multiple free trade agreements, including one with the European Free Trade Association, of which Switzerland, Liechtenstein, Norway, and Iceland are members, in 2002 (Liang, 2005). In order to reduce trade barriers further, by eliminating partially or completely customs duties on exports and imports, a free trade agreement with the EU has been signed and put into force in 2019 (EUR-Lex, 2018).

In 2022, Singapore registered S\$710 billion in total exports and S\$655.4 billion in total imports. Its main trading partners are the United States of America, Taiwan, Malaysia, and Mainland China as shown in Figure 8. In terms of major commodities traded between Singapore and foreign countries, for both exports and imports, machines, chemical products, and miscellaneous manufactured products represent 87.3% of total exports and 83.3% of total imports. Regarding Switzerland, more exports than imports are registered from Singapore, with S\$13.2 billion of exports and S\$9.3 billion of imports (Department of Statistics Singapore, 2023).

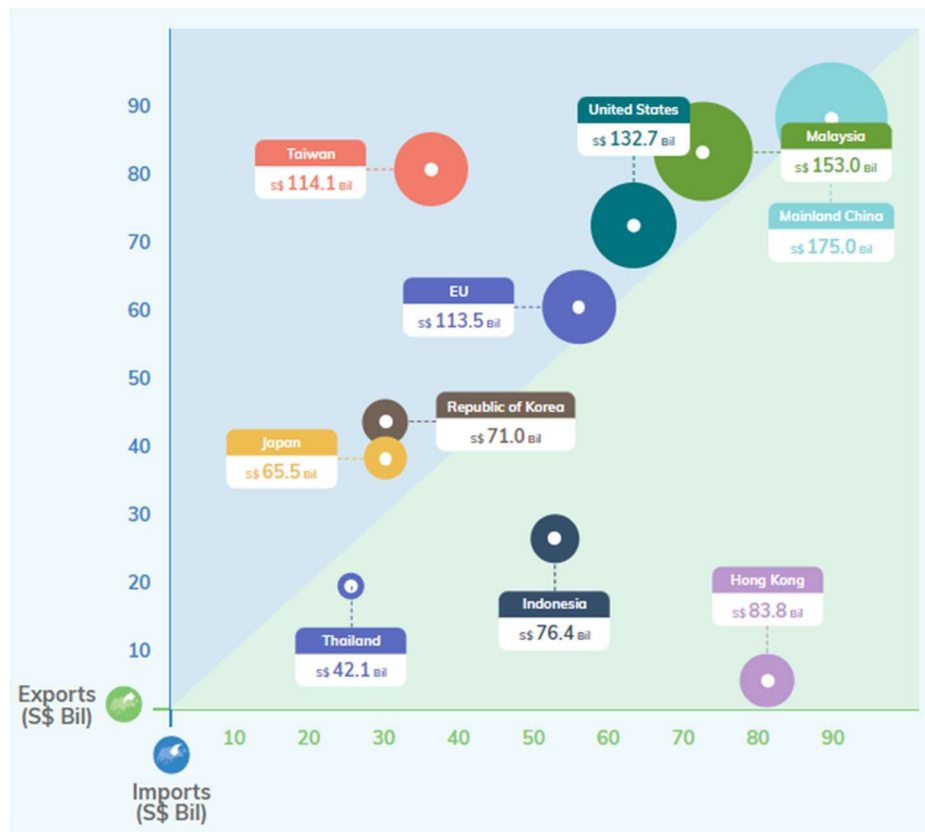


Figure 8 Merchandise Trade Performance with Major Trading Partners, 2022

Source : (Department of Statistics, 2023)

Foreign direct investment in Singapore has substantially increased since the last information obtained by the Singapore Department of Statistics from 2017 to 2021. Indeed, an increase of almost 37% in FDI has been registered between the periods, amounting to S\$1'562.2 billion in 2017 and S\$2'479 billion in 2021. Among the source countries, the United States represents the major investor in Singapore with S\$597.8 billion, and in the top 10, Switzerland is ranked 9th with S\$87.9 billion as shown in Figure 9 (Department of Statistics, 2023).

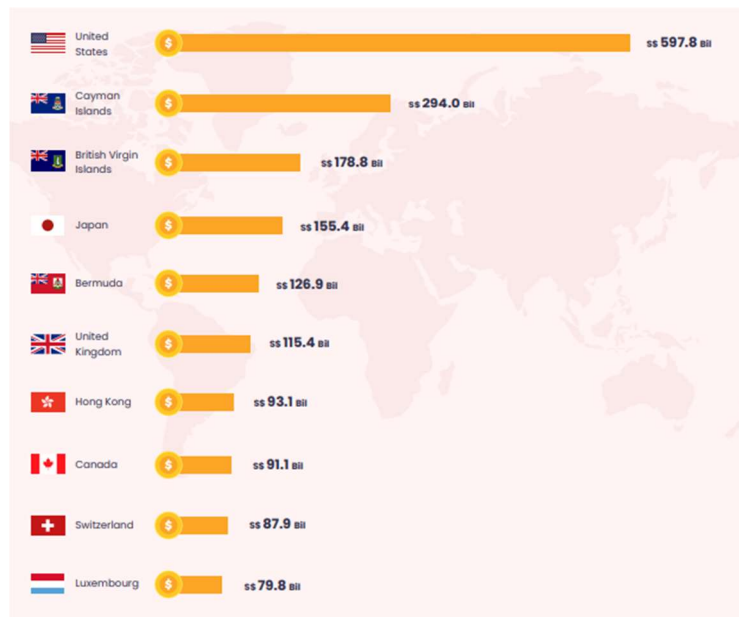


Figure 9 Top 10 source economies – 2021

Source : (Department of Statistics, 2023)

6.3. Import Trade policies between Switzerland and Singapore

Singapore and Switzerland cooperate in many fields. It all started in the 1830s when Swiss business representatives first visited Singapore and established closed partnerships to establish trade relations and beyond, such as the establishment of the Swiss Club, Swiss Association, SwissCham, and Swiss National Bank Branch in the Lion City. In Southeast Asia, Singapore is the first Asian country with which Switzerland signed a free-trade agreement (with EFTA). Singapore has on its territory more than 400 Swiss companies operating in the country (Federal Department of Foreign Affairs, 2022).

Goods and Services Tax (GST) is applied to all goods entering Singapore equal to or exceeding S\$400 (Inland Revenue Authority of Singapore, 2023). The rate applied since the beginning of 2023 is 8%. Singapore imposes high excise taxes on several categories, including vehicles (International Trade Administration, 2022) Regarding EVs, the Additional Flat Component of Road Tax (AFC) is at S\$700 and was introduced to compensate fuel excise duties losses (Ho, 2023). For customs goods, the GST is calculated as follows:

$$8\% * (\text{Cost, Insurance, Value and Freight (CIF)} + \text{all duties and other charges})$$

(International Trade Administration, 2022).

For example, if a company wishes to export a motor vehicle for S\$100'000 with insurance and overseas charges of S\$1'000, assuming that custom duties are 20% on the value of the vehicle

after customs (of S\$101'000), the GST of 8% will be applied on the final value of S\$121'200 (Singapore Customs, 2023).

However, under Free Trade Zones (FTZs), the GST and custom duties are not required when importing a good from a foreign partner (Inland Revenue Authority of Singapore, 2023), except when the goods leaves the FTZ (Singapore Customs, 2023). Regarding shipping methods, in order to pay import tax, companies need to register an account at the Interbank GIRO with Singapore Customs (DHL, 2022).

Singapore also plans to develop relations with international institutions such as World Bank, or the Asian Development Bank for more investment and trade openness. The Committee on the Economy of the Future mentions that in the future, in the ASEAN area, there will be more cooperation and fewer trade and non-trade barriers (Angelstorf, 2017).

6.4. Import Trade policies between Thailand and Singapore

Thailand and Singapore have a very strong economic relationship. In 2020, Singapore is the largest investor in Thailand with US\$1.8 billion. In total, Singapore has directly invested US\$24.9 billion in Thailand. The main investments are made in insurance, finance, wholesale, manufacturing and real estate. Trade between the two countries grew by 3.6% in 2021, totaling S\$34.1 billion. Taking into account only the half-year to 2022, total recorded trade is S\$21.6 billion (Chipman, 2022).

Goods traded between the two countries include gold, gems, jewels, refined oil, equipment, computers, circuit boards and other products. The two countries have signed several agreements such as the Singapore-Thailand Enhanced Economic Relationship (STEER) in 2022, regarding intellectual property and trade. They have also signed four memoranda of understanding (MoUs) and one memorandum of cooperation (MoC) on a number of topics, including intellectual property, meat trade, electric motorcycles and tourism. The MoU concerning electric motorcycles was signed by Singapore's SLEEK EV and Thailand's PPT Oil and Retail (PTTOR), to provide greater openness to this market and the opportunities it offers for the promotion of clean energy motorcycles and meet environmental and social needs (OR, 2022). In addition, the two countries signed bilateral agreements in areas such as cooperation, tourism, innovation, digital economy, trade, investment and sustainability (Chipman, 2022).

As part of ASEAN, Singapore and Thailand do not have direct bilateral agreements, but they do have agreements. When the 10-country Asian association was formed, members agreed to reduce import tariffs and remove import quotas to remove trade barriers (H&P Herrera and

Partners, 2019). In 2012, the ASEAN Comprehensive Investment Agreement (ACIA) was taken effect and adopted by members of the ASEAN to create an open, free and competitive investment regime with four pillars for ASEAN investors : protection, liberalization, promotion and facilitation (ASEAN, 2016).

For an exporter from Thailand, products must first comply with Singaporean preferential tariff's list to see if tariffs are applied. For example, agricultural products, machinery or equipment have zero rate tariffs with Singapore. Following this, the exporter is required to have the Certificate of Origin (Form D) in order to clear customs duty and proceed with export. To obtain this certificate, it is necessary to contact the competent body in the country in question. For Thailand, the institution is the Department of Foreign Trade and Trade Preference Division, via their website (H&P Herrera and Partners, 2019).

In 2018, the Customs Department of Thailand and Singapore Customs signed an agreement to reduce the difficulties of exchanging products between the two countries, both in the documentation required and in inspections, for greater efficiency when trading (Singapore Customs, 2018).

6.5. Singapore and its traffic policy

Singapore is well known for having introduced innovative laws to deal with traffic congestion in the city. As a small state with a large population of 5'637'022 (World Bank, 2023), the country launched strategies as early as the 1970s, reflecting on transport systems through a study carried out between 1967 and 1971. The Road Transport Action Committee was set up in the 1970s to anticipate congestion. The first initiative was to restrict the presence of private vehicle users by means of a payment system when people used certain roads. The vehicle quota system was introduced in 1990 to reduce the number of new vehicles on the road. This reduced the rate of increase from 6% to 3% per year. In addition, drivers are required to obtain a Certificate of Entitlement for a period of 10 years (One Motoring, 2023) from the government to be allowed to drive their new vehicle (ESCAP, 2023).

The initiative regarding restriction of vehicles came at a time of strong economic growth for Singapore, where GDP per capita had risen from 500 USD in 1965 when the country became independent to 2,500 USD in 1975 and 22,000 USD in 1998 when electronic payment for road measures was introduced. There was also a sharp increase in the population and a consequent need for private vehicles. The government had to strike a balance between giving citizens (the middle class) what they needed and at the same time managing the problem of

congestion. That's why only roads or neighborhoods with a high potential for congestion were targeted for the road tax system (Theseira, 2020).

The Economic and Social Commission for Asia and the Pacific (ESCAP) is a regional collaboration created in Shanghai after the World War II in 1947 and created institutions such as the Asian Development Bank. It aimed first at the economic development of the Asian region. Today, they put effort on achieving the 2030 Agenda which is fighting climate change and reduce inequalities (ESCAP, 2023). It defines mobility as :

“the integrated user-oriented transport systems and services that can make traveling safer, smarter and greener using innovative technologies” (ESCAP, 2022).

At first sight, building more roads does not solve the problem of congestion because these new roads end up creating traffic. Cities such as London and Hong Kong have experienced this, and the result was more congestion according to Yuan. Despite this, the government of Singapore launched a road-building program, and between 1965 and 1975, there was an increase in the number of roads by over 200 km. It was anticipated that this number would increase over the next few years, from 1995 to 2000 (Yuan, 1997).

The Land Transport Authority, a state institution responsible for developing and implementing policies and managing private and public infrastructure, gave the green light to a payment system for freeways in 1997. These strategies have led to a considerable reduction in traffic. The East Coast Parkway has seen traffic reduced by 40% during busy periods (Lan Yuan, 1997).

Motorcycles in the 1990s were not as popular as cars. In 1970, the number of users was equal to 51 out of every 1,000 people (Barter, 1999). However, in 1989, taxes of S\$20 per month or S\$1 per day were introduced. However, they remain two-thirds less intense than those on cars (Barter, 1999).

Concerning electric vehicles in Singapore, an electric car sharing program was set up in 2017 with a plan for 2020 to establish 1,000 electric cars and 2,000 charging points. There is also a bike-sharing scheme with a total of 40'000 vehicles available, and e-scooters benefit from just 10 vehicles across Singapore. In all cases, the government is committed to establishing strict laws that promote safe, sustainable transport. For example, as mentioned above, people riding e-scooters on sidewalks are fined S\$2'000 (ESCAP, 2022). On the other side, the authorities are also encouraging the adoption of EVs through measures aiming at reducing the cost of owning an EV. The first one is the EV Early Adoption Incentive (EEAI) in which a driver willing to purchase and register an electric car receives a rebate of 45% of the Additional Registration

Fee (tax payable when a vehicle is registered) and the second is the Enhanced Vehicular Emissions Scheme (VES) in which for some vehicles categories, the rebates will increase by S\$5'000. Moreover, for electric cars, the ARF floor is lower from S\$5'000 to S\$0 until December 2023 (Ministry of Transport, 2022).

The electric motorcycles in Singapore are divided into three categories: Class 2B (equal or less than 200CC and not more than 15Kw), Class 2A (between 200CC and 400CC with power between 15 Kw and 25 Kw) and Class 2 (more than 400CC with power exceeding 25 Kw). However, to use the public roads in Singapore, only motorcycles with a power range equal to or below 10 Kw can be registered. Since April 2020, the government has allowed electric motorcycles with a top speed equal to or greater than 50 km/h to be used on expressways (Land Transport Authority, 2020). The authorities also change its politics regarding the roads in cities by allowing motorcycles drivers with above 10kW to drive in town. Dr. Janil Puthucheary, Minister of State for Transport mentioned that this decision is related to sustainable mobility efforts (Stedman, 2021). Moreover, electric motorcycles users pay S\$200 per year as a tax to gain the benefits of not using combustion engines. The electric users also pay road tax for an amount of \$31 per year for the class 2B, \$31 to \$125 for the class 2A, and more than \$125 for the class 2 (Land Transport Authority, 2020). To compare, when registering a fuel motorcycle or scooter, S\$350 are for registration Fee, the additional registration fee amount for 15% of open market value if the amount does not exceed S\$5'000, 50% if the OMV is between S\$5'000 and S\$10'000 and 100% if the OMV exceed S\$10'000. Then the excise duty amount for 12% of OMV and finally the road tax which is based on the engine capacity (One Motoring, 2023).

6.5.1. EV Infrastructure in Singapore

Electric vehicle (EV) infrastructure refers to the network of charging stations and other facilities that support the use and growth of electric vehicles. There are many types of charging points, such as battery charging stations, battery exchange stations, and rapid charging stations. It is an assembly of electrical components designed specifically for charging EVs. The rapid charging points are better and have more power levels, and battery exchange stations are places where an EV user is able to swap a battery for a fully charged one with the corresponding vehicle (U.S. Department of Energy, 2023).

In Singapore, there are two types of stations: alternating current (AC), which is considered slow charging power with a range between 3.7 kW and 43 kW. They are built for long charging periods of many hours. On the other hand, there is direct current (DC), which provides a range

between 50 kW and 120 kW and usually charges an EV in one hour. However, AC chargers are less costly to use than DC chargers. In terms of costs, it will depend on the companies that provide charging points (Sgcarmart, 2021).

The country is currently aiming to install 60'000 EV charging points by 2030, of which 40'000 are in public parking and 20'000 are in private ones. Yet, 600 EV charging places were proposed, according to the Urban Redevelopment Authority and Land Transport Authority, in September 2021 (Ministry of Transport, 2021). Moreover, The Finance Minister Heng announced a budget of S\$30 million of EV infrastructure with a close private-public partnership for the next five years (International Trade Administration, 2021). By 2025, at least 12'000 EV charging stations will be implemented for every Housing and Development Board (public institution for home buildings) parking lot, according to the Land Transport Authority. Five companies have been mandated by the authorities to launch the plan across all of Singapore. The companies are: *Charge+*, *SP Mobility*, *SHELL Eastern Petroleum*, *ConfortDelGro Engineering*, and *Strides Automotive Services* (CNA, 2022). SHELL is planning to implement charging stations at half of their 57 petrol stations in Singapore. Eigen Energy, a local company, built a system of smart engine solutions in which the power output comes directly from solar energies stocked and distributed into EVs (CNA, 2021).

The following Table 1 shows the number of charging points in Singapore by the companies mentioned above in 2021, except for Blue Charge, which is not part of the mandate of the Land Transport Authority (Sgcarmart, 2021).

Charging Provider	AC power ratings	Pricing	DC power ratings	Pricing	Locations	Number of charging points
SP Group	3.7kW, 7.4kW, 11kW, 22kW, 43kW	\$0.525/kWh	50kW, 60kW, 100kW (150kW incoming)	\$0.588/kWh	HDB, URA and JTC carparks; malls (SPC service stations incoming)	600+
Shell Recharge/ Greenlots	3.7kW, 6.6kW, 7.4kW, 22kW, 43kW	\$3.00/hour (3.7kW, 6.6kW); \$0.40-0.50/kWh (7.4kW); \$0.55/kWh (22kW, 43kW)	50kW, 100kW, 120kW	\$0.55/kWh	Shell petrol stations; URA and JTC carparks; malls	600+
Charge+	7.4kW	\$0.5238/kWh	30kW, 50kW, 120kW	\$0.5582/kWh	HDB, URA and JTC carparks; malls; condominiums	Close to 100
CDG ENGIE	7.4kW, 22kW	\$0.5200/kWh	100kW	\$0.5600/kWh	HDB, URA and JTC car parks	Close to 100
Blue Charge (BlueSG)	3.7kW	\$1.00 for first 3 hours, \$2	N.A.	N.A.	HDB, URA and JTC carparks; malls	1'600+
Tesla Supercharger network	N.A.	N.A.	250kW	TBC	Across eight malls	24 (across eight stations)

Table 1 Number of charging stations and price comparisons

Source : Data based on the article provided by Sgcarmart, 2021

Moreover, Singapore's standards for Combined Charging Systems (CCS) which are direct current with more than 50kW follow those in Europe, which makes it possible for European EVs to adapt to their charging points and charge rapidly (Sgcarmart, 2021).

The Singapore Motor Cycle Trade Association has published several newsletters regarding the development of e-motorcycles. The current standard for the charging points of e-motorcycles, which was a public-private partnership, is Technical Reference 25, which ensures safety standards for operational and maintenance requirements. In 2016, it was reviewed to add low-power charging points, especially for motorcycles, and swapping batteries was included (SMCTA, March 2022). Regarding their homologation, since the industry does not have testing facilities in Singapore, there are difficulties in certifying electric motorcycles. Testing, inspection, and certification take 12 to 18 months. Therefore, this newsletter is from June 2022; there will be mass markets for e-motorcycles only in 2023 or 2024 (SMCTA, June 2022). When importing from Singapore, the Land Transport Authority mentioned that electric motorcycles are not controlled by the import control regime except for pocket electric motorcycles (Wong, 2021).

6.5.1. Importation and registration of a motorcycle or scooter in Singapore

Regarding the importation of a motorcycle into Singapore, many steps have to be taken. The Land Transport Authority shares a procedure on the registration and technical requirements for a motorcycle to be imported in Singapore, with a list of testing laboratories, inspection centers, and document checklists for registration. During an inspection, several features are examined, such as the brake, clutch system, headlamp, and speedometer, which has to be in units, meaning kilometers per hour. The authorities describe a procedure of four steps for importing a motorcycle in Singapore and six steps for registration (Land Transport Authority, 2023).

Regarding the importation steps, a company is required to have a shipping agent and right after an Inward Cargo Clearance Permit delivered by the Singapore Customs. During the assessment, several documents are required, such as purchase invoices, receipts, exhaust emission test documents, and a letter with the date of manufacture. All the documents must be in English. For the registration process, it will depend on whether the company itself does the steps or a motorcycle dealer does them (Land Transport Authority, 2023).

6.6. KyBurz Switzerland-Asia

Kyburz, a company based in Freienstein, Switzerland, was founded by Martin Kyburz in 1991 with the aim of creating environmentally friendly vehicles. The first invention was a solar-powered vehicle, followed in 1994 by electric vehicles designed primarily for the elderly and people with reduced mobility. The company is well known in Switzerland mostly because of their business to business relations and more specifically the delivery companies. The development of postal vehicles began in 2002, and the first electric vehicles were purchased by *Deutsche Post*. The Swiss Post saw its first vehicles in 2010. The Swiss company is an SME with a total of 180 employees in Switzerland (Kyburz, 2023).

In 2014, the company expanded its production and received ISO 9001 certification, which guarantees that the products offered are of the highest quality and can be continuously improved. In 2016, the company received ISO 14001 certification, which guarantees the health and safety of Kyburz employees and respect for the environment (Kyburz, 2023).

Kyburz has also developed a lithium battery recycling system to give end-of-life vehicles a new lease of life. In 2020, a recycling plant was set up to recycle lithium batteries, recovering up to 91% of the materials used (Kyburz, 2023).

The company also has delivered three-wheel vehicles abroad, including Thailand, Japan, Australia, New Zealand, Germany, Italy, Belgium, Austria, the Netherlands, Romania, Hungary, Slovenia, Finland, Norway, and Iceland. The company has two subsidiaries (Germany and Australia), 81 call centers, and 47 resellers. More than 25,000 Kyburz electric delivery vehicles are in use worldwide (Kyburz, 2023).

Expansion into Asia, more specifically Bangkok, took place in 2020 with the introduction of an exclusive distributor for the South East Asia. Part of the fleet is now produced in Thailand at the Rayong plant, but it is still licensed by *Kyburz* Switzerland (Kyburz Asia, 2023).

Between 2018 and 2021, a total value of 33 million euros has been identified for an order from Australia Post, for which *Kyburz* has taken out insurance with SERV by applying for a production credit. This enables *Kyburz* to benefit from lower bank interest rates, thus offering more financing options for Australia Post. SERV takes care of all the highly technical financial tasks, leaving the Swiss company to focus on the relationship with the Australian company. *Australia Post* has paid a 30% deposit in exchange for a guarantee that *Kyburz* will receive the amount due only when the Australian customer receives the order. According to founder Martin Kyburz, the help provided by SERV makes the company more competitive (SERV, 2021).

Today, the latest version of the electric three-wheeler for private elderly customers is the DX2 1.0 model, which can be configured for a maximum speed of 10, 20, 30, or 45 km/h. The vehicle has a range of 160 kilometers and consumes between 4 and 8 kWh (kilowatt-hours) over 100 kilometers. Depending on configuration, the model costs between CHF 14,900 and CHF 16,900, excluding options (Kyburz, 2023).

For delivery service vehicles such as those for the Swiss Post, the 5th generation DXP model is in use throughout Switzerland. The aim of this vehicle is to make work more pleasant for delivery operators when handling letters with an automatic parking brake system that activates at every stop. The model has a maximum speed of 45 km/h and a range of 115 km. It can load up to 120 kilos and 270 kilos with a trailer. The price is determined on demand, depending on the needs of the company. The Swiss Post has around 6'300 electric three wheel scooters, which makes them the largest fleet in Europe in 2016 (SWISS POST, p. 45, 2016). In Thailand, the model K-BEE based on the DXP 5 model, is tested by Thailand Automotive Institute and certified by Department of Land Transport. It integrates additional features such as a roof for protection against poor weather conditions (Kyburz Asia, 2023).

Their main value added is done Germany at 60% but the electronic components are Swiss Made. They rely also on suppliers such as in China for their batteries production. *Kyburz* focus on a environmentally friendly work conditions where all suppliers should know each other in order to have a good functioning of the company. (Kyburz, 2023)

6.7. The two-wheel market in Singapore

In Singapore, according to the Land Transport Authority, by the end of 2022, a total of 142'453 motorcycles would have been registered, 115 of them electric. In 2021, the number of electric motorcycles was 5 (Customer Services Division, 2022). So there's been a big increase in the space of a year, even if this increase is mainly due to the adoption of electric motorcycles by companies wanting to use them to change their image in line with sustainability promotion, according to the Channel NewsAsia (CAN). In fact, only two vehicles were registered by individuals due to a lack of charging points, according to industry experts (Yap and Ng, 2023). In June 2023, the number of electric motorcycles increased to 181 units (Customer Services Division, 2023).

Among these motorcycles (petrol and electric), the majority are between 101 and 200CC, with 93'242 units. Then the number of motorcycles between 301 and 400CC stands at 16'154 units (Customer Services Division, 2022).

According to ADB, in 2013, the number of motorcycles per 1'000 inhabitants was 27 and 25 in 2016. To compare, Vietnam, which is the country with the most motorcycles per 1'000 inhabitants, recorded 422 motorcycles per 1'000 inhabitants in 2013 and 498 in 2016. Thailand recorded 286 per 1000 inhabitants in 2013 and 298 in 2016 (Asian Development Bank, 2020).

6.7.1. The most implemented manufacturers of motorcycles

Manufacturer	Fuel Type	Units (2022)	Manufacturer	Fuel Type	Units (2022)	Manufacturer	Fuel Type	Units (2022)	Manufacturer	Fuel Type	Units (2022)
A.J.S.	Petrol	1	DERBI	Petrol	5	MATCHLESS	Petrol	3	SANG YANG	Petrol	1
ADIVA	Petrol	755	DUCATI	Petrol	1911	MEGELLI	Petrol	2	SANYANG	Petrol	4
AIDEA	Electric	5	ENERGICA	Electric	1	MLE	Petrol	32	SCOMADI	Petrol	58
ALRENDO	Electric	2	GAS GAS	Petrol	4	MODENAS	Petrol	5	STANDARD	Petrol	1
APRILIA	Petrol	680	HARLEY DAVIDSON	Petrol	2168	MOTO GUZZI	Petrol	111	SUZUKI	Petrol	4195
B.M.W.	Petrol	3603	HONDA	Petrol	41537	MUTT	Petrol	223	SYM	Petrol	3482
B.M.W.	Electric	1	HUSQVARNA	Petrol	153	NORTON	Petrol	26	TGB	Petrol	1
B.S.A.	Petrol	21	HYOSUNG	Petrol	3	P.G.O.	Petrol	182	TITAN	Petrol	1
BAJAJ	Petrol	1475	INDIAN	Petrol	43	PAJIFA	Petrol	2	TM RACING	Petrol	1
BENELLI	Petrol	5	ITALJET	Petrol	33	PEUGEOT	Petrol	140	TRIUMPH	Petrol	1105
BETA	Petrol	33	JIANSHE	Petrol	2	PIAGGIO	Petrol	4492	TVS	Petrol	24
BIMOTA	Petrol	6	K.T.M.	Petrol	2514	QINGQI	Petrol	22	VELOCETTE	Petrol	1
BRIXTON	Petrol	39	KAWASAKI	Petrol	2196	QUADRO	Petrol	17	VESPA	Petrol	906
CAGIVA	Petrol	10	KEEWAY	Petrol	51	R.A.P.	Electric	104	VICTORY	Petrol	18
CAN-AM	Petrol	57	KIDEN	Petrol	1	REGAL-RAPTOR	Petrol	2	VINCENT	Petrol	1
CFMOTO	Petrol	174	KYMC	Petrol	1563	RIEJU	Petrol	29	VYRUS	Petrol	1
CHUNLAN	Petrol	1	LAMBRETTA	Petrol	318	ROYAL ALLOY	Petrol	60	YAMAHA	Petrol	67010
COSA	Petrol	1	LEXMOTO	Petrol	20	ROYAL ENFIELD	Petrol	426	ZF-KY	Petrol	9
DAELIM	Petrol	426	LML	Petrol	18	SACHS	Petrol	6	ZONGSHEN	Petrol	106
DAYI MOTOR	Electric	2	M.V. AGUSTA	Petrol	184	SACIN	Petrol	12	ZONTES	Petrol	249
TOTAL		143092									

Table 2 TOTAL MOTORCYCLE POPULATION BY MAKE (End of Period)

Source : Based on the data provided by the Land Transport Authority – Customer Services Division, 2022

Table 2 above shows in table format the market share of the Singapore motorcycle industry in 2022. The total number of motorcycles represented, including tax-excepted motorcycles, is 143'092 units. Among the most prominent manufacturers are Honda and Yamaha, with 41'437 units and 67'010 units, respectively, which are petroleum-based motorcycles. As for electric vehicles, six brands are present, including *AIDEA*, *ALRENDO*, *B.M.W.*, *DAYI MOTOR*, *ENERGICA*, and *R.A.P.* *RAP* leads sales by a long way, with 104 electric vehicles on the road in Singapore (Customer Services Division, 2022).

6.7.1.1. Boon Siew Singapore - Honda

Boon Siew has been Honda's official distributor in Singapore since 1957. It turns out that Honda founder Mr. Soichiro Honda and Tan Sri Loh Boon Siew shared a good friendship, so much so that today the Honda company is still strongly linked to Singapore. With an almost 29% market share in the motorcycle industry, the brand is second only to Yamaha. As of today,

they have 23 stores in Singapore (Boon Siew Singapore, 2023). Their model list is categorized by:

- 200CC and below : 2 models of scooter, The PCX160 and the ADV160
- 201CC to 400CC : 5 models of scooters and motorcycles, the GB350S, Forza 350, ADV350, CB400X and the CB400SF
- 400CC and above : 9 models of scooters and motorcycles, the CBR650R, CMX1100 Rebel, CL500, XL750 Transalp, 2021 Forza 750, 2021 NC750X, CMX500 Rebel, 2023 Gold Wing and the 2021 X-ADV 750.

Regarding electric two-wheel vehicle, they released in Japan only on August 24, in 2023, the electric scooter model EM1(Honda, 2023).

6.7.1.2. Hong Leong Corporation Yamaha

Hong Leong Corporation has been the sole Yamaha distributor in Singapore for over 40 years. With a market share of almost 47% in 2022, it has the largest motorcycle market in Singapore. The brand also offers a wide range of products, including eight different scooter models from 155CC to 560CC. The best-known models are the Nmax 155, the Aerox 155, the X-MAX 300, and the Tmax 560. They even have a section dedicated to commuting, which is more suited to the local population in Singapore who are just looking for a means of transport to get from point A to point B while still having a style and a passion for motorcycling. They offer four models, including the Sniper 155, MT-15, XSR 155, and YZF 155. There are also a number of higher-end models, ranging from 300CC to 900CC and even sportier. For example, there's the R3 model with a smaller engine, the R7 for more experienced riders, or the more radical R1 (Yamaha Motor Singapore, 2023). Regarding electric motorcycles, the only relevant model is oriented toward electric dirt bikes with their recent model, the XE4 (Neary, 2023).

6.7.1.3. AIDEA

A new brand made its debut in 2019 during the Tokyo Motor Show event, *AIDEA*, a Japanese brand that produces three-wheeled motorcycles for emissions-free mobility. The bikes are designed by a famous Italian, Claudio Zanchini, and produced in Japan. They have markets in Europe, but also in Asia, mainly in Hong Kong, Singapore, New Zealand, and Australia. They have developed the AA-Cargo, AA-Wiz, and AA-1 models, which run on 100% electric power. The models are equipped with a charging system identical to that used on cars, making it easier to find charging points. These vehicles are designed for private use and for post, food service, and delivery companies, thanks to their rear-mounted trunks. The AA-wiz is the

smallest of the three, delivering 123 km per charge at 30 km/h. It is available in two engine types, 50CC and 125CC. The AA-Cargo has a range of 89 km, and comes in two versions. One is rated at 2.03 kW, the other at a more powerful 4.06 kW. Both take 3 hours to fully charge, or 2 hours at 75% charge. The motorcycle won the 2020 Nikkei Superior Products and Services Awards for being a vehicle that contributes to reducing environmental impact and meets social needs. In Singapore, the AA-Cargo is priced at S\$18'000 (Racewerks Motor Sports, 2023). The AA-1 is more of a commuter for private customers. Like the AA-Cargo, it has a roof and the same chassis, but with a more modern design (AIDEA, 2019).

6.7.1.4. ALREND0

ALREND0 is a Chinese company set up in 2019 with the aim of convincing motorcycle enthusiasts that riding electric is just as fun and exciting as riding petrol. It is in the process of concluding contracts with potential future distributors across Europe and is also based in Singapore (Alrendo Motorcycles, 2021). The brand is dedicated to offering affordable electric motorcycles, even more affordable than those with gasoline engines. Their products follow this vision, with a number of models available. The most recent is the TS Bravo, which is lighter in weight (less than 11 kW) and classified in class 2B. It can deliver a maximum power of 20 kW. The vehicle has a range of 419 km at 50 km/h, thanks to its 17.4 kWh battery. When recharging, the TS Bravo takes around 6 hours to charge with a 230 V portable charger (voltages), but this time can be reduced to around 3.5 hours with a 3.8 kW recharging point (Thijssen, 2021).

In Singapore, this model has been taken up at *ComfortDelGro Driving Centre*, a learning center dedicated solely to electric motorcycles, where apprentices receive lessons to familiarize them with this new type of vehicle. The center also uses an electric scooter, the Quantum G2, more suited to commuters. In June 2022, they added 5 electric motorcycles to their workforce and plan to have 100 by 2030 (Pereira, 2023).

6.7.1.5. BMW Motorrad

BMW Motorrad is a pioneer in the motorcycle industry. In 2023, they will celebrate 100 years of the brand worldwide. There are two distributors in Singapore. The brand specializes in all segments of motorcycling, offering a wide variety of models to suit all tastes. As far as electric vehicles are concerned, BMW Motorrad currently offers the C 400 GT scooter, the CE04, and, more recently, the CE02, a small electric motorcycle perfectly suited to urban use and fully customizable to suit all tastes. The CE02 can produce up to 15 hp with a range of around 90 km. The motorcycle can be recharged by 40% in 100 minutes using a fast charger. The CE04 is a larger motorcycle with 42 hp and 80 kW, a range of around 128 km, and a recharge time

of 65 minutes. In Singapore, only the CE 04 and the C 400 GT are sold currently. (BMW Motorrad 2023).

6.7.1.6. DAYI MOTOR

DAYI is also a Chinese motorcycle manufacturer, originally from Zhajiang province. The brand mainly offers small-capacity electric scooters ranging from 60 to 100 km (Dayi Motor, 2023). They are nevertheless aiming to penetrate the European market with their E-Odin model, with its 200 km range in sport or touring versions. In equivalent terms, it's a 125CC that runs on gasoline (Camus, 2021).

6.7.1.7. ENERGICA

Energica is an Italian manufacturer based in Modena that positions itself as a premium, high-powered electric motorcycle brand. The company is first made for the production of electric motorcycle components for the MotoE. Therefore, they have a certain expertise in the domain. In Singapore, the sole distributor has been Ifnyi since 2021 and sells, as of today, three models with the same battery capacity of 21.5 kWh. The models proposed are the EsseEsse9+, the Rebelle, and the Ego+. The three models also share some components and are for Class 2, which corresponds to the class with motorcycle power above 80 kW. The price position of these models corresponds to around S\$80'000, which can be compared to the Ducati V4, a high-fuel premium sport motorcycle (Wong, 2021). The price includes, however, the transfer, registration, road taxes, and Singapore Goods and Services Tax. The insurance and the Certificate of Entitlement are not included (K. Ramanujam, 2021).

In the article written by Mohan K. Ramanujam, Operations Head Eugene Mah of IFNYIL was questioned about the electric motorcycle market in Singapore. In 2021, government subsidies were lower, which partly explains why prices are high. According to Mah, it's better to make it a niche product that can then evolve according to government actions regarding EV infrastructure. He was also asked whether the company would like to expand into the Southeast Asian market, such as Malaysia, and Mah mentions that the plans are ready and present but that he lacks collaboration with the right person in Malaysia (K. Ramanujam, 2021).

6.7.1.8. Zhejiang RAP Intelligent Vehicle Co., Ltd

This Chinese company located in Huzhou city's Zhejiang province sells three-wheeled motorcycles with a business-to-business focus, specializing in electric motorcycles that can benefit delivery companies. The aim of the company's creation in 2018 was to offer a vehicle that doesn't pollute, is accessible, and meets the standards demanded by transport authorities.

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Its product range is divided into two categories: the Bange Series and the Oak Series (RAP SEV, 2023).

The Bange Series are three-wheeled electric motorcycles for transporting goods and services to customers. These can be letters to be delivered or supermarket goods to be delivered to customers, thanks to a rear compartment with a volume of 1600 L (with the possibility of keeping goods refrigerated), a top speed of 65 km/h, a range of 120 km, a charging time of 1.5 hours for over 40%, and a maximum weight of 250 kg (RAP SEV, 2023).

The Oak Series are smaller electric motorcycles with a 500-liter compartment, most often used to deliver newspapers or letters, take-away meals, and other small services. The vehicle is capable of a maximum speed of 45 km/h, with a range of 110 km, a charging time of 1.5 hours from 20% to 80%, like the Bange Series, and a trunk capable of carrying 50 kg. The second version, the OAK II, is more powerful, able to load up to 150 kg, reaching a top speed of 70 km/h but reducing range to 100 km (RAP SEV, 2023).

6.7.2. Singaporean motorcycle manufacturers

The next producers of electric motorcycles identified are local manufacturers who have local expertise, know Singaporean demand, and plan to rule the electric mobility market. Two manufacturers have been identified: start-up *Charged* and *Scorpio Electric*.

6.7.2.1. Singapore startup « Charged »

The first company is a start-up created in March 2022 called *Charged*, which features three e-motorcycle models, the CPX, VS1, and VS2 (Wong, 2023). The brand plans to deliver more than ten million e-motorcycles in Singapore alone over the next 10 years. Since its launch, the brand has delivered over 1,000 motorcycles to Indonesia, Vietnam, and Malaysia. The CPX, as with the other models, is very urban-oriented, with high technology and high-quality ergonomics, including the keyless system and reverse gear. The CPX can be fitted with an additional portable 60-volt battery, each weighing 17 kg and rated at 2.7 kWh. The motor is rated at 4000W, with a recharge time of 3 hours with fast charging or 5 hours with standard charging. The top speed is 95 km/h, with a range of 200 km. The vehicle weighs 152 kg with a single battery. Its initial price is Rp 46,000,000. The VS1 is a less powerful version but not far off the CPX, and the VS2 is an even less powerful model, with less power, range, and top speed (Charged Asia, 2023).

6.7.2.2. *Scorpio Electric*

Launched in 2017, *Scorpio Electric* is a startup that has only recently been expanding. It is designed to produce and sell high-performance electric two-wheelers. As with many startups, the COVID-19 crisis didn't help the brand grow, and it's only in early 2023 that the brand receives US\$6.75 million in funding from several investors to produce their first electric scooter prototype, the *Scorpio Electric X1*, equipped with the latest technology and a modern and futuristic design (Salim, 2023). The model is scheduled to be presented at EICMA 2023 in Milan, the largest motorcycle show, and pre-sales are underway. The announced data say that the motor develops 10 kW with a 72-volt lithium battery and reaches a top speed of 105 km/h. It has a range of 200 km at 40 km/h and a charging time of 3 hours (The Packs News, 2023).

6.7.1. **SingPost**

Singapore Post has been in existence for over 160 years, initially as Singapore's main post office. The company then expanded into other markets, introducing logistics services, and now has a presence in 15 markets. Their purpose is to deliver mail to people with a concern for protecting the planet. In 2021, the company decided to change its scooter fleet from three to 100% electric by 2026. They have over 700 motorcycles, including three-wheelers, and 140 vans (Phillip, 2021).

“As Singapore’s leading last-mile and postal service provider, our delivery vehicles traverse the length and breadth of the nation every day. There is tremendous potential for us to do better for the planet. By converting our delivery fleet to a fully electric one, we will be delivering a greener Singapore for everyone,” (Vincent Phang, CEO of SingaPost, 2021).

The first BYT T3 model is an electric van. According to *SingPost*, these new vehicles emit up to 75% fewer emissions than gasoline-powered vehicles. The BYT T3 vehicle has a range of 300 km and a large luggage compartment in the back that can hold 3,800 liters. They also turned to *RAP*'s IONA in the OAK category, which is also used by *SingPost*. This model has a range of 120 kilometers, considering that postmen drive around 15 to 20 kilometers a day. The vehicle can be loaded with up to 50 kg of cargo, with a volume of 500 liters at the back. It is a three-wheeler approved by the Land Transport Authority (Philip, 2021).

The Singaporean Post has also partner with a swappable batteries company named *Mo Batteries* to make the daily lives of postal workers safer. In September 2021, *Mo Batteries* received authorization from the Land Transport Authority to use this technology with a 12-

month permit. So there are two batteries installed, each taking 5 hours to recharge. Their electric motorcycles have a range of 50 kilometers on a single battery (Nian, 2023).

6.8. Complementary findings

6.8.1. Consumer behavior : Singaporean drivers and EV

In 2021, a study carried out by the *BMW Group* concluded that 46% of Singaporeans would be ready to buy an electric or hybrid vehicle for their next car. The study was based on a population of 1000 people, with a minimum of 700 being licensed drivers (Mikhail, 2021).

In 2021, 24% of the population will own and drive electric cars, and 75% will be familiar with electrics. Nevertheless, 41% of people think they will have trouble charging EVs and that EVs are only intended for short journeys (Mikhail, 2021).

There are many reasons for converting to electric vehicles. Government initiatives to encourage sustainable mobility, with their cost reductions for each use and accessibility to charging points, account for the bulk of motivations (72% and 70%, respectively). The other factors are a warranty up to 10 years (64%), good aftersales (58%), performance (55%), quality assurance (43%), and the features of the car (42%). In terms of use, 62% of Singaporeans surveyed would use the EV for commuting, and 42% would commute to work. Another 33% would use it on weekends (Mikhail, 2021).

According to the *BMW Group* study, Singaporeans drive 55 km a day and would save S\$ 7.50 a day by switching to a BMW electric vehicle (Mikhail, 2021).

6.8.2. Interview with Stromerbike Switzerland-USA

To complement the information collected by secondary research, an interview was conducted with a Swiss manufacturer of electric bicycles to understand the adoption of electric vehicles and the requirements for entering foreign markets for possible product expansion. The expert interviewed deals with the US market and was able to give advice and analysis relating to the electric vehicle market globally and specifically in the US.

The expert in this area is Matti Rajakylä, General Manager of *Stromer Bike* in the USA.

1. What is *Stromer*, and what is its value proposition?

Firstly, *Stromer* is a Swiss company that manufactures electric bicycles with the aim of changing people's mobility behavior. He then explains that their value proposition is based on

four points. First, the bikes are made in Switzerland. Secondly, the technology incorporated in their bikes consists of securing the bike with a GPS tracker in case of theft, for example. The third point concerns the bikes' range. The batteries can deliver up to 1'440 watts, with a maximum range of 180 km. The final point is the viability of the bikes, noting that 27'000 people currently ride them. The brand is committed to continuous improvement, despite the large number of players in the market.

2. In which market do you have the most demand?

The expert mentioned mainly European countries, including Switzerland, Belgium, the Netherlands, and Germany. Belgium remains the biggest market.

3. So what's the typical profile of your customer?

According to the expert, it depends on the market. In the United States, there are profiles that are oriented towards the usefulness of a bike and others who see it more as a hobby. There are also some very wealthy people who buy *Stromer*, particularly in San Francisco or Silicon Valley. In Europe, it's more likely to be the middle class that owns a *Stromer* bike. Otherwise, there are more male than female *Stromer* owners.

4. How do you think consumers will adopt this kind of vehicle?

To answer this question, the expert mentioned the benefits that consumers can expect. The first is environmental. In the U.S., he says, there's a lot of traffic, including in Los Angeles and San Francisco. In his experience, it took him 15 to 20 minutes to cover a distance of 8 miles (approx. 12.8 km) by electric bike. This kind of ride would take 45 minutes in Los Angeles, for example.

He then mentions other benefits, such as the possibility of getting some exercise on a bike, and being able to gain space by fitting 100 bikes into a 6-car parking space, as is the case in Europe, where bike spaces are limited.

Otherwise, he mentions that consumers are tied to their old habits, especially in the case of the USA. This is what the company wants to change globally.

5. Have you yet analyzed the markets of ASEAN countries such as Singapore, Thailand, or Hong Kong?

Although the expert only deals with the US market and doesn't have any answers to offer, he mentions that he has been to Singapore many times and that the market is there, as is the demand.

6. Let's take the US: how do you cope with policies when you enter a market? How do you adapt to the current environment of the country when proposing these kinds of vehicles?

According to the expert, before entering a market, it's important to find out what the country's legislation is. First of all, you need to know what bike classifications exist and, above all, whether the country has any. He mentions that in the US there are three classifications, the third of which concerns electric bikes. Electric bikes must therefore not exceed 45 km/h.

Secondly, as these are bicycles equipped with lithium batteries, it's important to identify the certificates and standards required. In the US, a law was signed this year in New York to certify the motor, batteries, and entire electronic system of electric bikes or scooters sold or leased under UL 2849 certification.

Each country has its own way of dealing with this. In Europe, electric bikes must be fitted with license plates, unlike in the US, where they are not required.

7. What role does the US government play in giving incentives for the adoption of EV?

According to the expert, more and more states in the US are proposing programs to give the electric vehicle market more opportunities, as in Colorado and California.

8. According to you, what are the key factors for consumers to adopt an EV vehicle, for example, e-bikes?

The main factors, according to the expert, are infrastructure and regulations. But there's also consumer education. In the U.S., more and more cities are putting in place the necessary infrastructure to enable people to commute or ride their bikes.

9. How do you see the future of electric mobility, and what role will Strummer play in it?

The General Manager sees the electric vehicle market growing from strength to strength, but is still concerned about the problems that may arise in the future with EV batteries.

He does mention that in Europe, standards are constantly evolving. For example, a promising new battery is currently being developed and is due to arrive in the next few years. This new innovation will improve battery safety in relation to the fire problems already reported. He concludes that at *Strummer* there has always been innovation, and they always want to be at the forefront instead of doing what others are doing.

In order to have a better representation of the strengths, weaknesses, opportunities, threats and all the ecosystem around Kyburz, a SWOT, PESTEL and Porter's Five Forces analysis is provided below and present the main insights about the strategy that any Swiss SMEs involved in the expansion of electric motorcycle should take into account.

6.8.1. SWOT Kyburz

S	W	O	T
Strenghts	Weaknesses	Opportunities	Threats
<ul style="list-style-type: none"> • Swiss Manufacturing Quality reputation. • Already a Hub of production in Bangkok which brings less distance for commercial transaction. • Less imports/exports charges. • Licence for its Recycling factory for lithium batteries (91% of components reused). • High experience with B2B relations locally and at international level. • Adaptable/change in featuresof vehicules according to the needs. 	<ul style="list-style-type: none"> • Deep market research for reaching theright potential clients with different needs than in the Swiss market. • High price position due to foreign apelation and additional charges for exportation. • Lack of EV infrastructure. • Singaporeans drivers not yet ready to switch to EVs despite they embrace the innovation. • Restriction of 10 kW in dense areas by Singapore Land of Transport Authority. 	<ul style="list-style-type: none"> • Possibility to reach SingPost with the gradual transformation of its fleet to EVs. • Governement's plans for EV charging points installation across all Singapore. • Possible partnership with Swappable battery company (ex : Mo Batteries in Singapore) • Implementation of a recycling factory in Singapore for sustainability promotion. 	<ul style="list-style-type: none"> • Manufacturing costs increase due to potential change and innovation for the Singapore market. <p><u>B2B Threats</u></p> <ul style="list-style-type: none"> • AIDEA with AA-Cargo with its reward in 2022 for innovation on social and environmental objectives. • RAP with Bange Series with adaptable use <p><u>B2C Threats</u></p> <ul style="list-style-type: none"> • AIDEA with the AA-1 model having the same features as the Cargo • Alrendo with TS Bravo model and 419 km range. • Charged Singaporean startup with its 3 electric model • Scorpion Electric with X1 model

6.8.2. PESTEL Kyburz

P	E	S
Political	Economic	Sociological
<ul style="list-style-type: none"> • Singapore and Switzerland Free Trade Agreements - both members of EFTA. • Singapore Free Trade Agreement with The European Union. • Singapore and Thailand Free Trade Agreements - Both members of ASEAN. • Singapore member of APEC and TPP • Government encourage corporate entrepreneurship and Foreign Direct Investment. • High initiative to reduce traffic in the country. • 60'000 charging points by 2030 • 4 MoUs and 1 Moc regarding many fields including electric vehicles. • Customs of Singapore and Thailand agreement on reducing barriers on trade procedures. 	<ul style="list-style-type: none"> • High developed economy with GDP per capita of \$54'530. • The lion city as a commerce hub for trade. • Export-driven country • 4th of world's most competitive economies. • Liberalized economy. • 2022 : S\$710 Bill. exports and S\$655.4 Bill. imports. • Manufactured products, machines and chemicals. represent for more than 80% of total trade. • More exports in Switzerland than imports with S\$13.2 Bill. and S\$9.3 Billion. • 37% increase in FDI for Singapore between 2017 and 2021 with USA being the major investor and Switzerland the 9th. • Goods and Services Tax (GST) of 8% applied to all goods and services entering the country for value more than S\$400. • Singapore the largest investor for Thailand with US\$24.9 Billion. • Trade between Singapore and Thailand grew by 3.6% in 2021. 	<ul style="list-style-type: none"> • 5'637'022 inhabitants in 2023 • 2017 : 25 motorcycles per 1'000 inhabitants. • 2021 : 46% of Singaporeans are ready for EV conversion. • 24% of Singaporeans questioned own electric cars and 75% are familiar with it. • 41% of Singaporeans questioned have wrong ideas with charging EVs. • Main factors for adoption are government initiatives and charging points accessibility and other such as 10 years warranty, aftersales services, performance, assurance quality and features. • 62% of Singaporeans questioned would use EVs for commuting. • 42% of Singaporeans questioned would use EVs for work commute. • 33% of Singaporeans questioned would use EVs

<div>T</div> <div>Technological</div>	<div>E</div> <div>Environmental</div>	<div>L</div> <div>Legal</div>
<ul style="list-style-type: none"> Evs stations types: alternating current (AC) and direct current (DC). SHELL's charging system based on solar panels energy More than 3000 EV charging points in Singapore. Technical Reference 25 standards for safety on operational and maintenance. Development of Swappable Batteries by Mo Batteries. License for recycling factory with 91% of reuse components. 	<ul style="list-style-type: none"> Promotion of sustainable mobility by the Land Transport Authority with it highly regulated traffic policies and future promotion of EVs. SHELL's charging system based on solar panels energy. EVs are 0% gaz emission during the use. In overall, there is 97% reduction in Co2 In moment of the usage, the EVs compensate the environmental costs of conversion. Possible implementation of lithium battery recycling facility in Singapore. 	<ul style="list-style-type: none"> Legal system based on parliamentary system of Government. Regulatory framework business-friendly for economic benefits. Restrictions at 10 kW, the power for electric motorcycles in dense areas. High sanctions in case of non-respecting rules in Singapore. High excise taxes on vehicles for imports. Goods and Services Tax (8%) applied to all imports (exceptions for FTAs) Certificate of Origin required for companies exporting in Singapore. Certificate of Entitlement with a validity of 10 years to drive a vehicle. taxe of S\$20 per month or S\$1 per day introduced for motorcycles in 1989. Combined Charging Systems (CCS) follows Europe standards. Class 2B : =< 200CC and <15kW with tax of S\$31 Class 2A : between 200C and 400CC, 15 Kw to 25 Kw with tax from S\$31 to S\$125. Class 2 : => 400CC and >25 kW with tax more than S\$125 S\$200 Tax per year Technical Reference 25 for e-motorcycles 12 to 18 months for e-motorcycle testing and registration

6.8.3. Porter's Five Forces



Threat of new entrants

- Charged with 3 electric models
- Scorpion X1
- Alrendo TS Bravo



Threat of substitutes

- AIDEA AA-Cargo
- RAP SERV Bange Series I and II



Bargaining power of suppliers

- 60% of added value in Germany
- electronics from Switzerland
- Chinese battery supplier
- Importance of environmentally friendly work
- all suppliers know each others



Bargaining power of buyers

- Singapore Post
- Other delivery companies
- More power over Kyburz with multiple choice of electric motorcycles models

Discussion

6.9. Summary of the important findings and literature review

Through all the research carried out, many information and knowledge regarding the electric two-wheeler market in Singapore were acquired and can therefore allow a more depth analysis of what Swiss SMEs specialized in this sector can offer to penetrate this market and propose products tailored to the needs of the local population and to businesses.

6.9.1. Consumer Behavior regarding EV

Some existing knowledge enabled us to understand how a consumer behaves when faced with the diffusion of a new technology, and more specifically, with the electric vehicle. They allow us to assess how these innovative technologies require a certain amount of adoption on the part of the consumer, and whether the consumer needs more or less time to adopt them.

According to the primary data survey carried out by the *BMW Group* in Singapore, the population is well and truly aware of the change and the transition to a more electric world. A good part of people questioned, including 46% of Singaporeans, are between early adopters and late majority, as they are ready to adopt electric vehicles for their next car. What's more, of those questioned, 75% are familiar with EVs, which is a good sign for Swiss companies and for all competitors wishing to reach and convince the Singaporean population.

There are, however, some concerns about the availability of charging points and government initiatives. In fact, although the population questioned is ready for change, they also assess the cost that this may represent in terms of investment. The respondents are mainly counting on the government to allocate more subsidies to companies selling electric vehicles, in order to make them more affordable. Researches in Singapore regarding the environmental and economic impact of electric vehicles shows that, in the long term, it's more economical and sustainable to drive an electric vehicle. Firstly, there is less need to produce components for electric vehicles, and fewer raw materials are exploited. Secondly, maintenance costs for electric vehicles are also lower than for combustion vehicles, making them more economical for consumers in the medium and long term. *BMW Group* also mentioned that, on a day-to-day basis, people converting to electric vehicles would benefit from a reduction in the cost of charging their vehicles of S\$7.50 per charge compared with combustion vehicles in Singapore. The *Stromer Bike* expert also noted that the demand in Singapore is there, so there's an opportunity to reach the local population.

6.9.2. Internationalization of Swiss electric motorcycles SMEs to Singapore

As far as the internationalization of Swiss companies is concerned, research has shown that SMEs have a unique capacity to contribute significantly to a country's economic growth, thanks to their investments in manpower, know-how, job creation (especially among the middle class), and the relationships of trust they build with local institutions. However, they may find it difficult to internationalize, as this requires a great deal of research, and it is risky to venture into uncharted territory without the right tools.

Access to financing is one of the main difficulties faced by Swiss SMEs due to their smaller size. They therefore need to obtain external advice, in particular from Swiss non-profit institutions or non-profit associations only that can best advise Swiss SMEs on the steps to take when expanding into foreign markets. Swiss SMEs can obtain payment guarantees, as was the case with *Kyburz* for the distribution of their products in Australia. The company took out an guarantee policy with SERV to ensure that it would receive its payment while at the same time benefiting from a lower interest rate thanks to the financing facilities offered by the Swiss institution. It is therefore essential to analyze the market environment in depth and to be proactive. The Swiss Global Enterprise institution gives insights on the Singaporean regulations and policies and support the SMEs into their first steps when internationalizing. The SwissCham and SwissClub in Singapore allow Swiss SMEs to develop more their network through many interesting and attractive events.

6.9.3. EV charging points projects

The Singaporean government is moving to open up the EV market, mainly for climate reasons. Plans to install 60'000 charging points by 2030, with the participation of several players, including SHELL, will increase the likelihood of electric car use thanks to greater accessibility. In addition, certification of electric motorcycles is also recent and slow due to the lack of facilities to test the products. However, empirical research in Singapore has also shown that in the next few years, an increase in the presence of electric motorcycles on the road is very much on the horizon and will enable established companies to benefit from this growth and new entrants to take advantage of attractive opportunities.

6.10. SWISS electric motorcycle SMEs exploration with the example of Kyburz Switzerland-Thailand

These opportunities can therefore benefit Swiss SMEs, in particular *Kyburz*, which offers products that may be suitable for the local Singapore market when compared with the players

A market study of electric two-wheelers in Singapore: Exploring market entry of a Swiss Made motorcycle company

present in the market. Information on import taxes, conditions, and regulations for electric motorcycles, the relationship that Switzerland and Thailand share with Singapore, and the free trade agreements that these countries have with each other, will enable *Kyburz* to further develop its penetration strategy in this market through the implementation of their hub, which is an exclusive distributor that produces electric motorcycles in Bangkok.

6.10.1. Free Trade Agreements advantages

Indeed, it has been reported that Singapore and Thailand have concluded an agreement that will explore the electric motorcycle industry and thus potentially expand in this field. What's more, customs procedures between Singapore and Thailand are set to be streamlined and simplified for greater efficiency when exporting and importing. So, with free trade agreements, including the reduction or elimination of import quotas and the advantages in terms of trade policies, *Kyburz* can more easily penetrate a market from its production site in Thailand, gain competitive advantages, and offer more affordable prices thanks to the savings made on customs charges, which competitors coming from Japan or China, cannot benefit from.

By taking *Kyburz's* key products, it is possible to compare what works in Switzerland and see what can be done better in Singapore with what the competition is doing, whether international manufacturers, local manufacturers, or startups, and adapt *Kyburz's* products to meet the needs of consumers and businesses.

6.10.2. Kyburz's DXP model

At *Kyburz*, it was identified that the most widely used vehicle in Switzerland is the DXP model, which offers comfort and practicality for postal and other delivery workers with a significant range of 115 kilometers. The features offered by this model also have significant advantages that differentiate it from the competition, such as automatic vehicle stops when unloading. Knowing that the price is on request, it will be interesting to see how the competition is positioning itself, especially the brands producing similar products. The DXP 5 model of *Kyburz* amounts for 17'000 CHF in the Swiss market which at first not a competitive price. However, since they adapt their model to the business needs, the price can fluctuate. For example, by dividing the total amount charge to *Australia Post* with the number of units, the price of the DXP model amounts for 11'000.- euros, which is way below than the Swiss market and more in line with what the competition propose. Moreover, the K-BEE model is already a model that could be transpose for the Singaporean market since it is adapted for the Thailand territory.

6.10.3. Competitive advantage

What is also important to note is the battery recycling system *Kyburz* has developed, which recovers almost all the raw materials for reuse in the production of a new vehicle. Given that Singapore is increasingly promoting sustainable management, this innovation is a key argument and an added value that *Kyburz* can highlight, just like Swiss manufacturing excellence.

6.10.4. Opportunities

The postal company *SingPost*, which recently introduced electric motorcycles to its fleet, is an ideal destination for *Kyburz*. Having already had experience with the Swiss Post, *Kyburz* needs to establish a commercial approach to contact the Singaporean post office to create a bond of trust and discuss potential sales contracts. In addition, *SingPost* plans to include a partnership with the *Mo Batteries* company, to create strategic battery swappable points to ensure the efficient movement of postal workers. This is also an asset that the Swiss company can exploit by adopting its batteries at these battery exchange points.

6.10.5. Threat of competition and their competitive advantage

However, there are a number of players responding to the electric motorcycle market in Singapore, offering highly innovative solutions.

6.10.5.1. Direct competitors for B2B

For the most part, *Kyburz's* products are aimed at companies that need efficient functions to deliver their products on time and in good condition. The *RAP* brand, which has sold the most electric motorcycles for *SingPost*, and the *AIDEA* brands represent the biggest threats to the Swiss electric motorcycle SMEs wanting to do business in Singapore. Indeed, with the similarity of their products and their knowledge of demand in Singapore, they already have a considerable lead and market share. Regarding *RAP*, the Chinese company has a few arguments in favor of the use of their electric motorcycles. The company proposes many features for its models, such as keeping products cold for deliveries and a truck that can be changed in multiple ways to correspond to the right purpose.

6.10.5.2. Direct competitors for B2C

For private individuals, it's interesting to compare and see which brands stand out the most, especially the Made in Singapore manufacturers, who have a different approach to

international competitors. Despite holding the largest market share, *Yamaha* and *Honda* do not represent a threat to the electric sector, as no products in this sector are offered or in circulation in Singapore. Among the other manufacturers, there are a few models to keep in mind. From *AIDEA*, the AA-1 is very promising, offering all the functionalities of the AA-Cargo while being suitable for private use. The TS Bravo from Alrendo, which is used by the driving school, also has great potential with its unique differentiation of having a range of 419 kilometers. Despite having expertise in electric motorcycles with the MotoE, the Italian manufacturer *Energica* is not a threat for *Kyburz* because of its high price positioning, high powered motorcycles, and brand reputation for premium products, which are less destined for people looking only for commuting.

However, the two Singaporean manufacturers may pose difficulties for the Swiss company with electric motorcycle models that are highly adapted to the local population. In fact, *Charged*, a start-up, has already positioned itself with three models that have their own style and utility for commuting. The only differences between the models relate to vehicle performance. Otherwise, all three models are equipped with high-end technological features, including the possibility of adding an extra portable battery or reverse gear, giving them a competitive edge in terms of ergonomics and ease of use. Regarding the unique Scorpio Electric model X1, it also proves to be very promising thanks to a design that is close to that of BMW's C-Evolution electric motorcycle, but with an upgrade and top-of-the-range equipment and a performance announced as very high with its 200 kilometers of autonomy and 105 km/h maximum speed, all with a price that is certainly more affordable for Singaporeans compared to international brands or foreign SMEs wishing to reach this Singaporean market.

7. Conclusion

The conceptual and empirical research provided an overview of the electric motorcycle market in Singapore and the surrounding environment. To answer the main question, three sub-questions had to be answered. The first was whether the government is encouraging the country's electrification through the policies it has put in place. It turns out that Singapore has recently become more proactive in encouraging the adoption of electric vehicles, and more specifically, electric motorcycles.

This was followed by an analysis of the expansion opportunities and challenges for the SME manufacturing electric motorcycles *Kyburz* for a possible reach the Singapore market. Through conceptual research, several tools are available to Swiss SMEs to provide them with all the knowledge they need about a market and the strategies to adopt before making any decisions. They also have the support of Swiss non-profit organizations in Singapore to ensure that they are accompanied in the best possible conditions.

Empirical research has demonstrated the opportunities of exporting to Singapore, such as the free trade agreements between Switzerland and Singapore, which considerably reduce export costs and procedures for the Singaporean market. Finally, concerning the added value that SMEs provide, Swiss electric motorcycle manufacturers must focus on Swiss innovation and quality, as *Kyburz* has done with its highly efficient recycling system, which is a major asset, considering how Singapore supports sustainable development with the reduction of CO2 emissions.

The main difficulty was finding empirical information on a very specific subject where the trend is currently changing. What's more, as this is a very strict niche market, it's difficult to assess whether the trend in EV adoption in Singapore will change in a few months' time. However, thanks to two semesters of study of emerging markets under the supervision of Professor Phillipe Regnier, who taught a practice-oriented approach to research under real conditions while developing his students' soft skills, the findings suggest that Swiss SMEs have an interest in exploring this competitive and constantly developing market.

7.1. Perspectives for future research

For further exploration of electric motorcycles in international markets, this analysis may enable Swiss SMEs to analyze other markets in other advanced modern cities such as Kuala Lumpur, to other major cities in Southeast Asia and to other city-states such as Hong Kong, Dubai which are similar to Singapore but with fewer restriction or to other ASEAN markets.

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Appendix 1: Interview transcript

1. What is Stromer, and what is its value proposition ?

Stromer is an E bike company from Switzerland and the general vision is to change the mobility and commuting behavior of people.

The value that we offer is our bikes and we don't like to call our bikes only bikes since they are bikes with motor vehicles and that's how we want to stand out from the market. We are also proud of ourselves for example for the Swiss made design.

The second one is the connectivity of our bikes. Everything is connected. We have this in-built computer that we call the Omni, which is connected to the cell network, and you can track our bikes. Everything is connected to your phone. If somebody steals your bike, you can track it, and there are many other features you can adjust.

The third one is the range, because our bikes are known as commuter bikes and as vehicles. Then, obviously, we have batteries that go up to 1440 watts. We say 150, 100, and up to 180 kilometers is the range on our bikes, and then we try to develop the technology the best we can because we know that it's a new industry that's still very unripe and there are a lot of players at the moment.

The other thing is the reliability of our bikes. The technology is fantastic. Everything is there. We see people with 27,000 miles on their Stromer bikes still riding strong.

2. In which market do you have the most demand?

In Europe. I would say countries like Belgium, Switzerland (because of the Swiss brand), and the Netherlands are the strongest. Then I would say Germany is the next one from there. But Belgium, by far, is the biggest market for us.

3. So what's the typical profile of your customer?

It depends on the market. In the US, for example, some people see it as a vehicle or a utility that they commute to work with. But for some others, it's almost like a gadget or a toy. Let's say in Silicon Valley, the San Francisco area, you have wealthier people that buy our bikes. But in Europe, for example, because it's a replacement for your car, if you think about the financial investment that you have to make, it can be just for a middle-class person. It's a mostly male percentage. I would say maybe 6'000 men and women somewhere.

4. How do you think consumers will adopt this kind of vehicle?

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The feedback so far has been just fantastic. There are so many benefits. Environmental benefits are number one. You are not driving your car. In countries like the US, for example, if you think of big cities like San Francisco or even LA, the traffic is just ridiculous. It's just crazy. There have been some studies showing that the average American drives maybe 6 miles with his or her car. I just walked 8 miles from my hotel to the office today, and that took me 15–20 minutes. It would not take the same time with the car. In some or other places, like LA, that kind of drive might take like 45 minutes because of the traffic.

You save a lot of time, there's a motor that pushes you, and you get a little bit of exercise when riding a bike. Also in Europe, the parking spaces for bikes are very limited. There was actually a picture of six parking spots where you could fit 100 bikes. It's as simple as that, and there are so many different benefits. It just makes sense for many people. But people are just used to their habits, especially in the US. They like to drive their cars, and that's kind of like what we're trying to change on a large scale.

5. Have you yet analyzed the markets of ASEAN countries such as Singapore, Thailand, or Hong Kong?

Currently, I don't. I'm in charge of the US market myself, and that's my main focus. So yeah, in terms of expanding, I don't know; obviously, there must have been some initial exploration because that obviously makes sense. I know Singapore. I've been to Singapore many times myself, and I know the market there. Most likely there would be some sort of demand for our bikes, but to be honest with you, I don't really have a clear answer for you.

6. Let's take the US : how do you cope with policies when you enter a market ? how do you adapt to the current environment of the country when proposing these kind of vehicles ?

Well, there are a couple of things that you have to think of. What are the different classifications for electric bikes? In the USA, we have class 1, class 2, and class 3 bikes. In Europe, class 3 is called the speed pedal. In the USA, it's called "e-bike." That means that the top speed of that bike cannot exceed 28 miles per hour or 45 kilometers per hour. You have to see it when you enter a new market. You have to see what the legislation is in that sense.

Then obviously, it's an electric vehicle with a lithium battery. What are the standards or what are the certifications that you have to get for your batteries?

In the US, they currently don't have a countrywide standard. But in New York City, they signed a law that this year, every bike that is sold or rented (it can be an e-scooter or e-bike) must

have UL certification, 2849 to be exact. It means that the battery, the motor, and the whole electronic system have to be certified by UL. Those are obviously important things. Other than that, there are no restrictions here. But, for example, in Europe, these bikes need license plates. Here, you don't really need that. In Canada, they don't have Class 3 electric bikes.

7. What role does the US government play in giving incentives for the adoption of EV?

In Colorado, for example, there's a very good incentive program for buying electric bikes, and California's pretty good as well. More and more states are starting to give more incentives, and many times there are some good ones.

8. According to you, what are the key factors for consumers to adopt an EV vehicle for example in your case the e-bikes ?

Well, the key factors are, I think, a couple of things. Number one is obviously policies and infrastructure, and that's more like the city or state level. Then, the other thing I see is consumer education. Why? What is the reason to get a more expensive e-bike, specifically a Stromer? Then, what is the legislation ? Sometimes it might make your life a lot harder.

If the legislation and incentives are in place, those will definitely help us. In some cities in the US, you already see that the cities are putting efforts into infrastructure for biking and commuting.

9. How do you see the future of electric mobility, and what role will Stromer play in it?

Well, it's growing. Electric cars and vehicles are growing. However, I have some doubts because, again, it's such a new industry and people are going full steam ahead without thinking of the problems that might lie ahead, especially with the electric cars right now. But I see it growing exponentially, and people are going more and more towards that.

I would say in Europe, we are always the ones that are paving the way, and it's kind of like the golden standard. We are currently creating a new solid-state battery that will be available in the next few years. So that will definitely be a big game changer in terms of the safety of our bikes because of the potential battery fires that have been reported, especially with the cheap programs. Stromer has always been an innovator, and we want to be ahead of the game instead of copying what everybody else is doing.