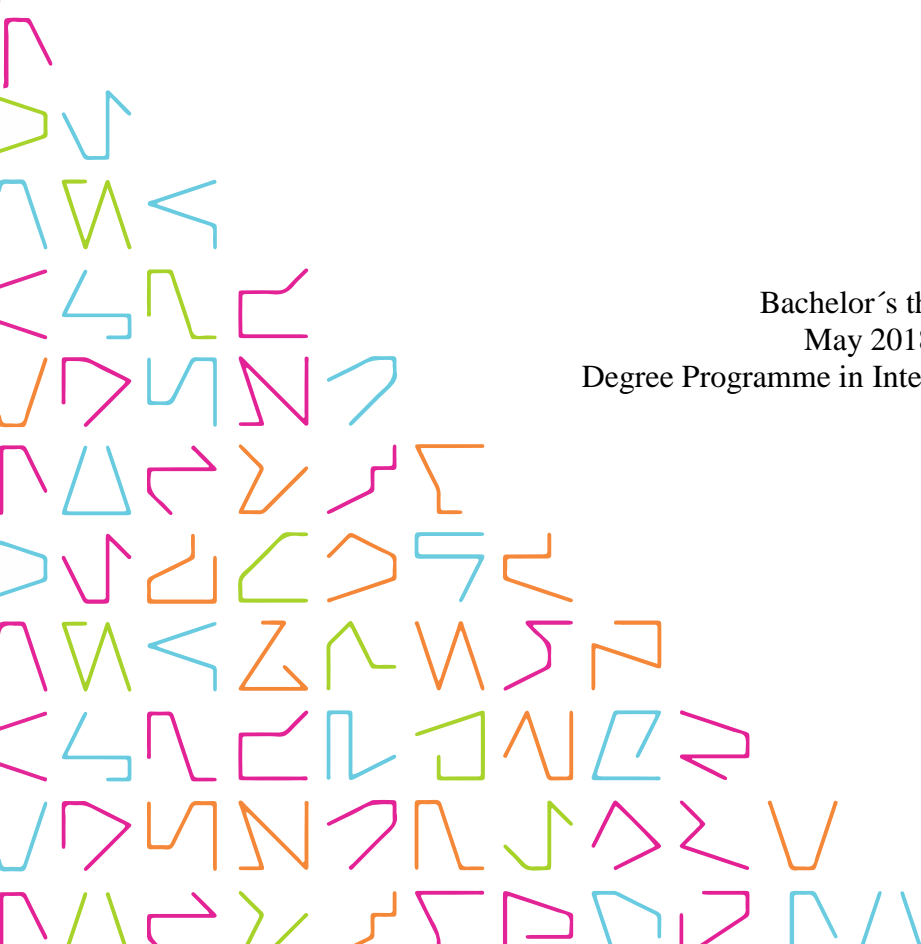


BACHELOR'S THESIS

E-bike market possibilities in Taiwan

Venni Metsäranta

Bachelor's thesis
May 2018
Degree Programme in International Business



ABSTRACT

Tampereen ammattikorkeakoulu
Tampere University of Applied Sciences
Degree Programme in International Business

VENNI METSÄRANTA
E-bike market possibilities in Taiwan
Research for Seowon Ltd.

Bachelor's thesis 86 pages, appendices 15 pages
May 2018

This thesis was commissioned by Seowon Ltd. for the research of emission free alternative sources of transportation in the Taiwanese market. The commissioners of this thesis are Anssi Harjunpää (Managing director of Seowon Ltd.) and Petteri Vilén (Senior lecturer, TAMK).

The main purpose of this thesis is to identify whether CleanTech companies operating in the transportation industry target the Taiwanese market for electric bikes. The following topic addresses the importance of the CleanTech industry, the sustainable development in Taiwan as well as e-bikes as a green alternative mode of transportation.

Through the research of online sources, academic literature and the topics issued by the commissioners, a framework was created based on an extensive analysis of the already existing data to research a potential market for e-bikes. The prices and results gave an understanding of the current market for the e-bike industry and an indication of whether there should be a market entry or not.

The competitive analysis conducted in this research discovered the possible competition in the foreign and the Taiwanese market. The results suggest whether a company should target the Taiwanese market for the e-bikes or whether a partnership with a local manufacturer could be the most beneficial option for both parties. A follow up for this study is recommended to measure and validate the data given and increase the possibility of a successful market entry.

Key words: CleanTech, sustainable development, transportation, e-bike, Taiwan

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GLOSSARY, ABBREVIATIONS AND TERMS

CC	Cubic Centimetre
CAGR	Compound annual growth rate
CleanTech	Clean Technology sector
CMC	China Motor Corporation
CRM	Customer Relationship Management
CSR	Corporate Social Responsibility
DGBAS	Directorate General of Budget, Accounting and Statistics, Executive Yuan, R.O.C. (Taiwan).
E-bike	Electric bike
E-bicycle	Electric bicycle
EU	European Union
EWBR	Electric Bikes Worldwide Report
HRM	Human resource management
ISO 9001:2002, QS 9000	Product requirement for customers' needs and applicable regulatory requirements software
kWh	Kilowatt hour
MtCO ₂	Metric tons of co ₂
MOTC	Ministry of Transportation and Communication R.O.C
Mil.	Million
NTD	New Taiwan Dollar
PESTEL	Political, Economic, Social, Technological, Legal and Environmental analysis
PRC	Peoples Republic of China
R.O.C	Republic of China (Taiwan)
SWOT	Strengths, Weaknesses, Opportunity, Threats analysis
TAMK	Tampere University of Applied Sciences
U. K	United Kingdom
U. S	United States
WTO	World Trade Organization

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1 INTRODUCTION

1.1. Research topic

The focus of the thesis is to research potential modes of clean transportation in the Taiwanese market. The author of this thesis is highly involved in the CleanTech and sustainable development. An opportunity posed itself when Seowon Ltd. had a need for a researcher with the adequate skill set to deliver an academic analysis that would be beneficial for the company's future. The marketing research profits the company by introducing new business opportunities for domestic and international companies in Taiwan.

In Taiwan's capital city, Taipei, there are currently two main providers of emission free electrical scooters, one being a company called Gogoro (Gogoro Inc. 2018) and the other one being China Motor corp. (M. Fulco 2017). They both saw a market opportunity for small electric vehicles. The decrease of scooters that run with petrol would be a major change in the air quality in Taipei. In this thesis, I will engage upon the questions that address why the people of Taipei or Taiwan use scooters, ATVs, motorcycles and other small vehicles. What could be the elements to take into consideration that can shift people to greener solutions?

The Taipei-Keelung metropolitan area has 7 million people and generally considered as the capital region. The city proper is rather small. There is nothing that makes the larger vehicles favourable– they will just become less convenient when the cities grow. (IPFS 2018)

1.2. Seowon Ltd. background information

Seowon Ltd is a sales and market entry consultancy that focuses on technology companies in Asia that have interest in growing their business. The company employs experienced and bilingual sales executives and offers a practical, low-risk and cost-effective solution to establish a strong presence in Asia. Seowon Ltd. focus is to generate new businesses and offer their clients sales, business development, and representation services in Asia. "Whether you want to expand your revenue and market share, establish partnerships, or manage existing accounts and channel partners, we deliver results." (Seowon Ltd., LinkedIn 2018) (Appendix 1. Will provide additional information about the company)

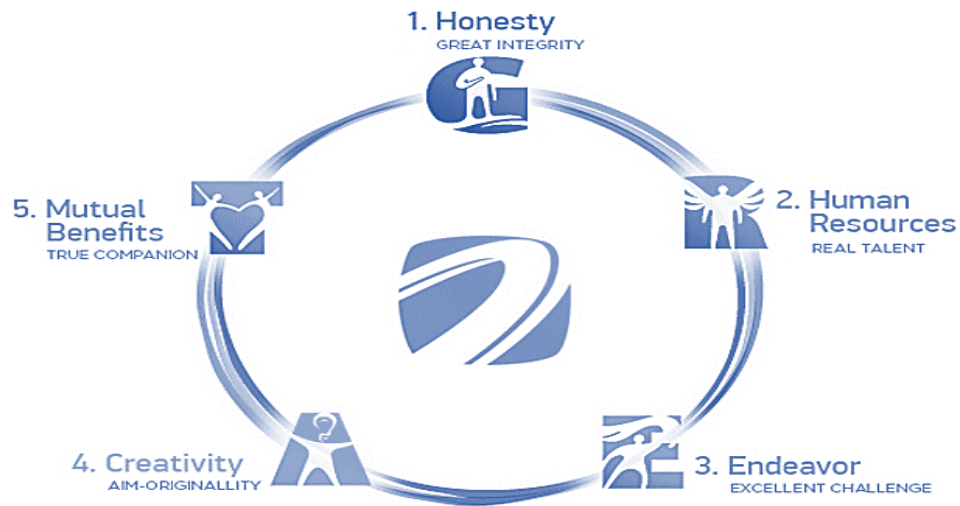


FIGURE 1. Core values of Seowon. (Seowon Ltd 2014)

1.3. Objective and purpose of the thesis

The key objective of this research is to identify the potential emission free modes of transportation in Taipei. The paper aims to benefit the company and give new business opportunities for domestic or international companies in Taiwan. The main questions that are going to be analysed are as follows:

- Who are the possible competitors for e-bikes in the Taiwanese transportation industry?
- What is the supply and demand of e-bikes?
- What are the reasons to choose an e-bike rather than a scooter, e-bicycle, ATV or a motorcycle?
- What is the estimated overall cost to produce a single e-bike?
- What is the company strategy/business model for the e-bike market in Taiwan?
- How does Taiwan compare in demand and supply of e-bikes to other countries such as China, Germany, USA or U.K? What is the effect of Chinese market towards its smaller neighbour?
- What would be the best market entry strategy for e-bikes in Taiwan?
- What are the legislations and laws that could intervene with the e-bike business and is there going to be any changes in the future? Possible intervention from the Taiwanese government concerning the driving license and age limit for e-bikes?

1.4. Methods, framework and thesis structure

The framework of this thesis focused on the market possibility of a new mode of clean transportation in Taiwan. The research conducted on this topic will demonstrate the possibilities and give a clear vision for the companies on whether they should invest or not in Taiwan itself. The framework of the thesis will provide a clear structure and offer a perspective on how to optimise sustainable development in the future in Taiwan.

Analysing these factors will reinforce the current theories and support the existing data as well as generate new interesting questions. The framework will provide a structure to the thesis and offers the case institute a clear perspective how the new mode of transportation would enter the Taiwanese market. The new source of transportation will be introduced in the third section of this thesis.

This thesis is made for the reader to understand the principal idea and the possibilities of sustainable development in Taiwan. It helps the reader to understand the need for which the research is conducted for. Furthermore, the purpose of the thesis is to clarify the approaches of the research on the alternative mode of transportation.

After the introductory part, there will be an overall analysis on the market possibilities in Taiwan and the already existing sustainable development sector. The research will go into depth with possibility of introducing a new or enhancing the already existing businesses in the country. Taiwan has the perfect location to make it a sustainable development centre and use its market as a strong base for the future of emission free transportation. The framework acts as a guide to the thesis structure through the analysis of the already existing market, the Taiwanese market structure and the possibility of a new mode of transportation. The goal of the thesis for Seowon Ltd., is to find a company that would invest in Taiwan and start a new company in the CleanTech transportation area.

The thesis will close with the results and discussion part. This part will identify the possible opportunity for a company to enter the Taiwanese market with a new mode of green transportation.

2 CLEANTECH

CleanTech is one of the biggest energy business sectors that will have an even bigger market in the future. The importance of CleanTech will grow since the battle of the climate change has begun. The sea levels are rising, the drought is becoming more intense, and the increase in natural disasters and the meltdown of the polar caps have made many company's concern to think how they can change their business into greener and contribute to the fight against the increasing temperatures. It is impossible to predict what will happen; if there will not be any intervention against the global warming. It is up to all of us to do our part and wake up to the reality that will face the future generations and us.

Many companies have already taken initiatives and begun changing their strategy to greener. However, it falls to the biggest companies to make major changes that there could ever be any changes in the global warming. Countries such as China and South Korea have already understood the importance of clean energy since they have cities that already struggle with breathing. China (10,151MtCO₂), USA (5312 MtCO₂), India (2431 MtCO₂), Russia (1635MtCO₂), and Japan (1209 MtCO₂) area leading on the emission output per year. (Global carbon Atlas 2016) These countries have the biggest responsibility towards the global warming.

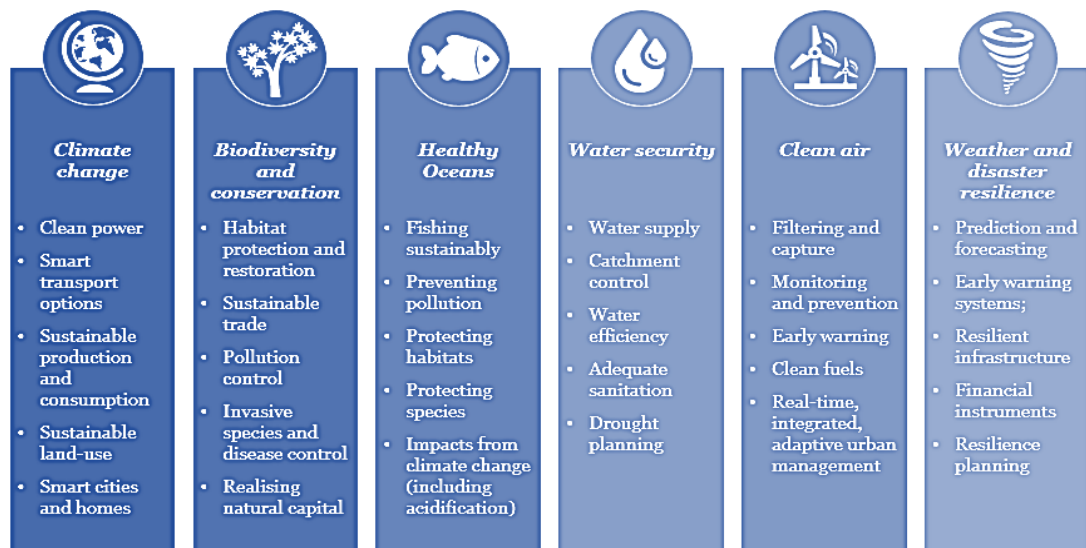


FIGURE 2. Six ways to save the world. (C. Herweijer 2018)

The picture above identifies the problem that the world faces. Finding clean sources of power and transportation are just one of many problems. (C. Herweijer 2018)

Taiwan as a CleanTech market area

Officially Taiwan (ROC) sees itself as part of China, but PRC sees it as a rebelling region, much like China sees Taiwan. There is little western influence in Taiwan than compared to China, but Japanese influence is still relatively strong. (C. Urquhart 2016)

CleanTech area has grown in the neighboring country China; however, it is still relatively small in Taiwan. The mentality of Taiwanese's people is that they value nature, but to grow as a nation, they might require energy sources like coal for it to become reality.

According to the Swedish research, Taiwan had in year 2015 four green industries developments that they wanted to master in near future. These are the Solar PV, Wind power, LED and Energy ICT. (Business Sweden 2015, 7-10)

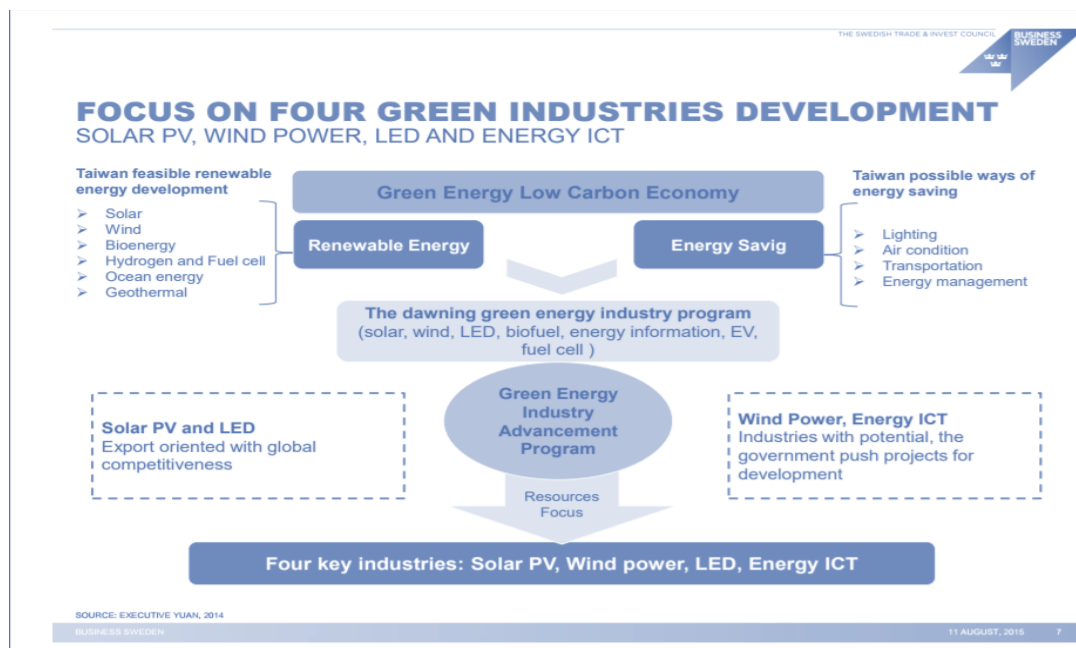


FIGURE 3. Focus on four green industries development (Business Sweden 2015)

The figure above illustrates the results of the research. The figure shows the direction in which Taiwan is trying to move. They are focusing on areas such as renewable energy, energy saving and in green industry itself. This results in the increased interest of alternative modes of transportation. It is as important to have an effective infrastructure in the industry sector as it is in the transportation sector. The government of Taiwan invested 1.74 billion of dollars to renewable energy at the end of 2010. (Wang April 20, 2011) This means that Taiwan is thinking of the future and making the right solutions that will benefit them in the future.

Renewable Energy Businesses in Taiwan is internationally attractive and Taiwan has numerous companies involved in the renewable energy and energy efficiency sector. (Wang April 20, 2011)

2.1. PESTEL Analysis

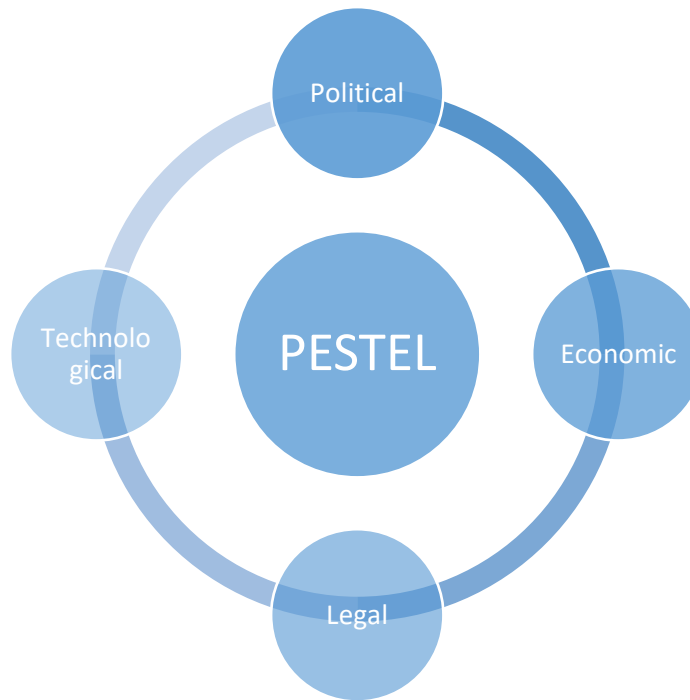


FIGURE 4. PESTEL analysis

A PESTEL analysis stands for organizations external factors that they take into consideration before entering a market. The letters stand for Political, Economic, Social, Technological, Environmental and Legal. (Oxford College 2016) This thesis will cover economic, legal, technological and political aspects of it, since it would be too large analysis if the focus would be on all of them. Parts in the future chapters and go more in detail with the most important ones.

The PESTEL analysis is a part of the company's strategy that should be repeated at regular stages (6 monthly minimum). It identifies the changes in the macro environment and forms a strong backbone to the organization for being successful and responsive to changes and can master the competition and create a competitive advantage. (Oxford College 2016) It gives the company and easy way to go through the business from

different sides. When all parts of the PESTEL are covered, the company is one step closer entering the market.

PESTEL should be used when:

1. Your company is planning to launch a new product or a service.
2. Targeting a new country or segment.
3. Exploring alternative routes for entry.
4. Assessment of potential impacts of external and internal factors to your organization from both market strategy and operations perspective. (PESTLE Analysis, strategy skills 2013, 7-9)

The thesis will elaborate on how the political situation of Taiwan affects the market entry and how rapid the changes in legislation and laws are. If the change is too slow, will it affect the new business in a negative way? The most relevant for CleanTech is the environmental aspects, since the mode of transportation must be a green solution. This will be covered in small parts of the thesis, since it will be made clear that the e-bikes run on electricity.

The technological advances determine the need of new solutions or usage of already existing ones. It consists of already existing materials and it there will be a combination of new materials when it is clear what will be the main materials used for the current e-bike. E-bike industry will be one of the fast-growing markets and will provide opportunities in many sectors and segments. The aim is to enter the Taiwanese market with adequate information and try to find the right segment for business.

There will be a clear and structured analysis on the different components required for an e-bike. Structured and detailed information of the e-bike parts, costs and models are in the appendix.

2.2. Corporate social responsibility

Corporate social responsibility (CSR) refers to companies that take responsibility of their actions as a company and aim to affect the society in a positive way. CSR is important for the sustainability, competitiveness, and innovation. It benefits the company in terms of cost savings, customer relationships, risk management and human resource management. (European commission 2018)

When starting a new business for e-bikes, it is relevant to consider the CSR aspects before and during the business is running. Some parts such as HRM are more essential when the company grows bigger and it is harder to maintain relationships with all the employees. The hiring process should be personalized, because many companies change their employees fast and many employees change their workplace quite often. The process should involve the employees as much as possible. The better method would be to hire people more as they would be your family in future. The harder it is to execute the larger the company is. (K. Väisänen 2018, 75-104)

Why is CSR important for every company?

CSR should be the basis of every company, since companies that are interested in the electric vehicles market in Taiwan should be aware of the big changes in CleanTech market. (N. Fallon December 29, 2017) The new company entering the Taiwanese market should already take into consideration the possible negative impact on society if it plans to start an industry.

All the leaders of government, businesses and the civil society unite to the most ambitious action on climate change for the benefit of this generation and generations to come. (A. Guterres 2017, 3-6) Temperatures rise by 3°C or more every year and if there won't be any intervention, it is hard to predict what problems there might be in the future. The emissions curve must stop rising before the global warming becomes an unsolvable problem. "All of us – Governments, businesses, and consumers – must make changes. More than that, we will have to 'be' the change." (A. Guterres 2017, 3-6)

In the interests of society, CSR offers a way on which a more efficient and united society can be build and the base for the sustainable economic system. (European commission

2018) Strategy part will elaborate more about the CSR and how it will be implemented to the e-bike business. (See part 3.2)

2.3. Efficient customer relationship management for the company

CRM is a strategy managing system that takes care of company's relationships and interactions with the existing customers and the new customers. It improves the profitability and long-term planning of the company's business structure. (Salesforce 2018) Several companies outside of Taiwan exercise a system where they have a rapidly changing employee system. When employees are being fired or they change workplaces, it is important to have an efficient CRM system that enables new employers to have the contact information of the customers. This secures the customer relationships. (K. Väisänen 2018, 75-104)

CRM system supports sales management, contact management, productivity and several other management activities inside and outside of the business. CRM does not only work for sale, it increases the productivity as a sales and marketing gadget. It has potential to go from HRM to customer services and all the way to the supply-chain management. (See Appendix. 5 for Cloud-based CRM) (Salesforce 2018)

The CRM system would govern the new customer's maintaining a long-lasting relationship while searching for new customers. The target group for the e-bike consumers mainly consist of middle class people aged 15-70 having no more than one child. Investing in a secure and advanced CRM system will enable the company to have a competitive edge over the rapidly changing market.

Benefits of an efficient CRM system:

- Updated database.
- Reliable and accurate information.
- Increase of sales and productivity.
- Improved forecasting.
- Less platforms and administration required.
- Improved products and services. (Salesforce 2018)

2.4. Global Mind-set

The world is globalizing more every day and the businesses need to stay alert at all times and try to open their eyes to the world. For a business, it is important to understand the market as whole and be aware of the changes happening around them. It does not matter how much international experience you have if you are not aware of the individuality of a person. Some rules and norms do not work the same way as they work in your own country. Being open, flexible and adjusting to the situations will give you and competitive edge in the ever more international markets.

These are the five important parts:

- **Recognize your own cultural biases and values.** Building strong self-awareness and non-judgemental perspective
- **Know your own personality traits.** Be critically curious of your surroundings
- **Learn about the business culture and the workplace.** This turns the attention away from yourself.
- **Networking.** The stronger intercultural relations you have the better you can expand the business and explore the endless possibilities.
- **Build strategies that integrate the best to your own style.** Build trust and try to find a common ground. (S. Dubberke 03. August. 2017)

These five steps are especially important for companies that want to expand to other countries but are afraid of losing to competition or not being aware enough of the cultural differences and consequently losing their presence. Taiwan serves a potential market area since it is located near many economic powers such as China, Japan and South Korea.

Harvard business review approached global mindset from another perspective and it can be divided into three different components:

- **Intellectual capital:** Global business awareness, cognitive complexity, business outlook and image
- **Psychological capital:** Interest and mindset for diversity and self-assurance with self-awareness
- **Social capital:** Intercultural impact, interpersonal involvement and understanding of diplomacy (L. Erfesoglou August 18, 2017)

Industry leaders or company leaders that possess the forward-thinking attitude with long term planning, understand the need of extensive knowledge on intercultural relations, international business and the globalization. Those who seek to understand the history, economic structures, culture and the socio-political systems in the different regions of the world, have a competitive edge against the other companies in the specific industry. (L. Erfesoglou August 18, 2017)

3 ELECTRIC BIKES

Electric bikes or shortly e-bikes are the mixture of a motorcycle and an electric bicycle. E-bikes have qualities from both modes of transportation: such as the battery, a motor, a throttle, a controller and two wheels; one being in the front and the other being at the back of the e-bike. The core idea of the e-bike is to provide a safe, energy efficient, practical and a modern way for travelling. Its attractive design, silent sound and inexpensive price make it a sought product in the Taiwanese market. (Navigant research 2016) The chapters below go into more detail with the properties and functions of the e-bikes and deliver information of the e-bike market.

Market plan for e-bikes

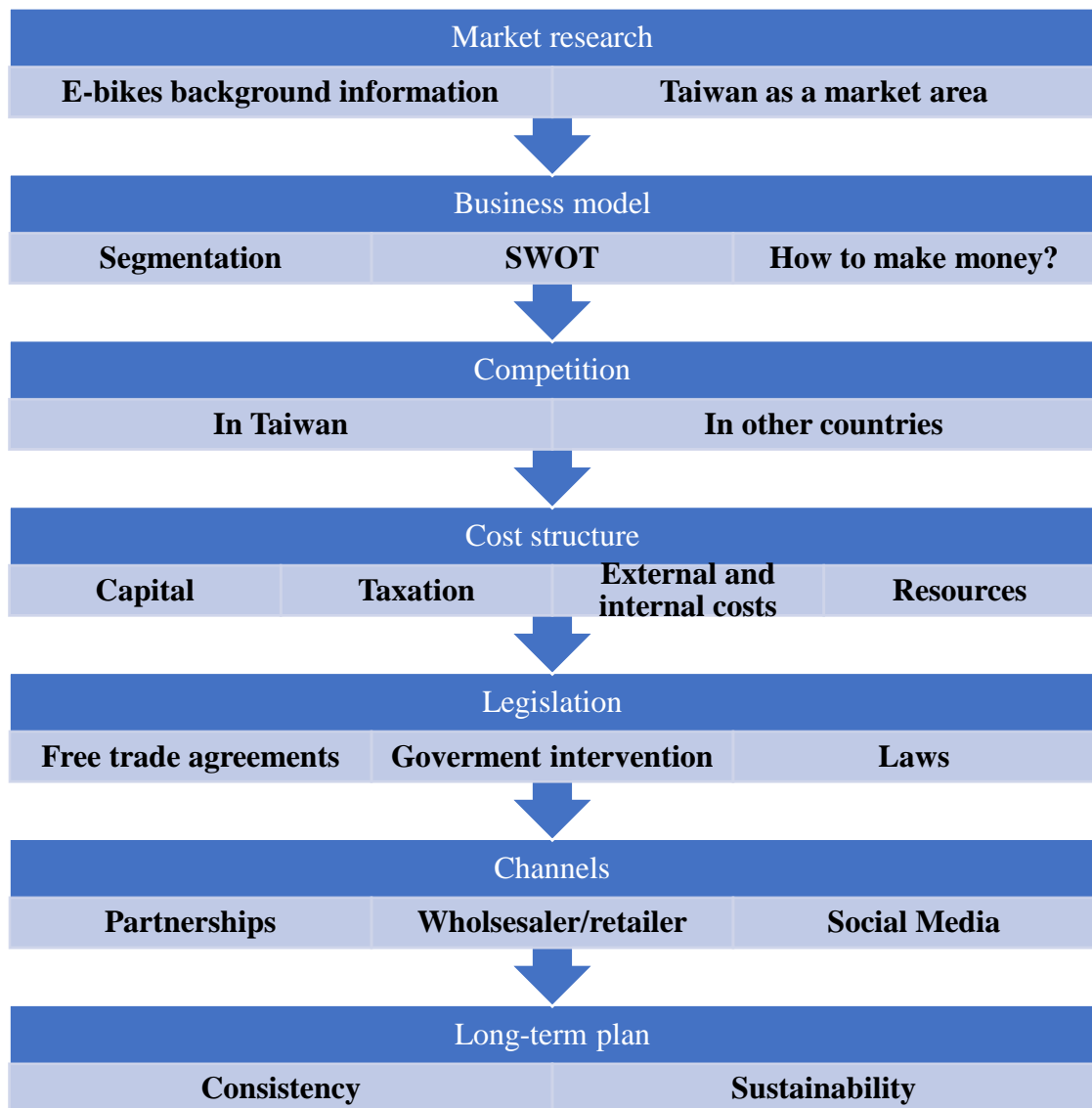


FIGURE 5. Market plan for e-bikes

3.1 SWOT-Analysis for e-bikes

SWOT-Analysis stands for Strengths, Weaknesses, Opportunities and Threats analysis, which aims to show the company what are the best ways to enter the market and what are the possible problems that the company might face. This is an efficient way to illustrate what is the current situation of the market. SWOT offers a simple and a clear way of communicating about your initiative and an excellent way to organize the information you need to run the company. Below is the usage of SWOT and the external and internal indicators that might intervene when entering the Taiwanese market.

Using SWOT is never compulsory, however here are the key elements why it should be used. (Community tool box 2017)

- Examine the possibilities for new solutions or the prevention of unwanted problems.
- Customize the decisions for your own company path. Identify your opportunities for the future milestones and beware of the threats that affect your directions and choices.
- Be flexible and spontaneous, the market changes every day and the company should change with it. Look for change where change is possible. When company knows its strength and weaknesses, it can avoid the problems and focus on those opportunities.
- Adjust and reconsider your business model. A new opportunity might come pass, while a new threat could end a path that once existed. (Community tool box 2017)

Internal and external factors affecting the SWOT

SWOT can be divided in to two major parts depending on the factors that affect it; they are internal and external factors. There are several factors for both categories and this chapter will go more in debt through them.

Internal factors are your resources and experiences. These are few general areas to consider:

- Access to natural resources; patents, trademarks and copyrights.
- Physical resources, that are your facilities, machinery and location.

- Financial part, funding agencies, investments, government support and other sources of income.
- Processes; employ programs, software systems.
- Human resources, that consist of your staff, board members, target population and sometimes family members. (PESTLE analysis 2018)
- The company image and hierarchy.

The ones mentioned above are the strengths and weakness of your company's internal factors, however do not forget the customers and partners outside your company. Maintaining a healthy balance between these two enables the company to be operating for a longer period.

External factors are the opportunities and the threats for your company. No company, organization, group or government is immune to outside events and forces. External threats and forces that affect your business are:

- Future trends in the business field and culture.
- Demographic factors: changes in the age, sex or race in the local area.
- Change in the economy, being national, international or local.
- The physical environment and its changes.
- Changing of legislation and laws. This might affect the e-bike costs and the market entry if the laws intervene and prevent the market entry itself. (Community tool box 2017)

Below are the SWOTS for the consumer and manufacturer with external and internal factors.

BUSINESS PLANNING SWOT FOR THE CONSUMER

ANALYSIS OBJECTIVES	
<p>The perspective of the consumer. What are the factors that matter to the consumer and what will help in getting the products sold?</p>	
INTERNAL FACTORS	
STRENGTHS (+)	WEAKNESSES (-)
<ul style="list-style-type: none"> • Easy to use and practical • No required license • Low cost in the long-run • Safety • Variety in use: for different types of drivers • No need to buy gas • No need to change oil filters and clutches 	<ul style="list-style-type: none"> • Relatively expensive • Not enough space for other family members
EXTERNAL FACTORS	
OPPORTUNITIES (+)	THREATS (-)
<ul style="list-style-type: none"> • Climate friendly • Reduction in co2 • Clean air • Less noise • Reduction of cars and other polluting transports • Park it as a bicycle 	<ul style="list-style-type: none"> • Lack of diversity • Enough spots for recharge • E-Scooters • E-bicycle market
EVALUATION OF OBJECTIVES	
<p>A practical and useful mode of transportation that will become the core part of every one's life.</p>	

FIGURE 6. SWOT for consumer (Smartsheet Inc. 2018)

BUSINESS PLANNING SWOT FOR MANUFACTURER

ANALYSIS OBJECTIVES	
<p>The perspective of the manufacturer. What are the costs, taxation, laws, internal and external factors that might intervene with the companies?</p>	
INTERNAL FACTORS	
STRENGTHS (+)	WEAKNESSES (-)
<ul style="list-style-type: none"> • Sophisticated and flexible market • High-quality products • High demand • Especially for big cities • Future of CleanTech • Attractive business for the future 	<ul style="list-style-type: none"> • Many required certificates and permits for production • Expensive technology changes • Legislations and laws
EXTERNAL FACTORS	
OPPORTUNITIES (+)	THREATS (-)
<ul style="list-style-type: none"> • Not a single strong competitor in the e-bike market • Right time to invest before other competition • High supply and mass production • The future of travel • Increase in urbanisation 	<ul style="list-style-type: none"> • Price sensitive market • Chinese market • Free trade agreements • Taxation
EVALUATION OF OBJECTIVES	
<p>Enable the company to grow and secure future profits and success.</p>	

FIGURE 7. SWOT for manufacturer (Smartsheet Inc. 2018)

3.2. E-bikes as a modern and climate friendly way of travelling

In Asia people tend to value more a mode of transportation that does not require any physical effort. This means that they do not value that much trends like living healthy and exercising. The things that they find appealing are the fast, practical and easy ways to travel. This means that the vehicle must be cheap, easy to use, fast and integrated to the infrastructure. (Bicycling in Asia 2008, 27-33)

Currently many cities in China such as Beijing and Shanghai are dominated by e-bikes and in the future, the market is expected to grow. China must face climate change and the problem of pollution. This serves as a proof that there is a market for the e-bikes especially in big cities that rapidly need a change for better air quality. (C. Buckley May 30, 2016)

The e-bike industry is booming, because factors such as urbanization, battery technology development, improvement of small vehicle infrastructure, aggressive city energy policies, and better supply of low costs and high-performance products. However, there are issues such as low consumer awareness, low gasoline prices (e.g. in the Middle Eastern countries), a lack of adequate infrastructure for smaller vehicles, and high purchase prices in comparison to the traditional bicycles. (Navigant research 2016)

E-bikes vs. electric bicycles

Electric bicycles are the future of smart travel. They combine exercise and transportation. It is a perfect mixture for everyone, since you can optimize your day by first using it as a vehicle and then cycling back from work. The cost of using it is almost non-existent. (Optbike 2018)

Benefits of the e-bicycle:

- Lose weight, stay in shape while having a normal work routine
- Stay fit and have more energy for the day
- Have fun; easy way to combine sport and leisure
- Imagine travelling to work without being sweaty and cycling back to home when it does not matter if you are sweaty.
- Versatile, used in various nature conditions and used e.g. as a mountain bike. (Optbike 2018)

However, in Asia it is not so common to care about health and the beneficial form of everyday exercise. That is why this thesis will focus on the market of e-bikes and not e-bicycles. (Bicycling in Asia 2008, 27-33)

Riding any bike at all gives you many benefits. Freedom, stress-reduction, increase in health, more free time and enjoyment in general. We should not dismiss other benefits, such as reduced car traffic and cleaner air. (F. Krug 2018) The difference is in the fact that e-bikes enable people to ride farther and faster. You do not have to be worried that you won't be strong enough or have enough endurance to complete a ride.

Electric bikes probably will never completely replace the regular bicycle or the car. By doing research, reading owner reviews and finding a high-quality e-bike from a company, will give you an excellent solution for your everyday needs. (F. Krug 2018)

The Figure below will show you the main difference between, the e-bike, and the e-bicycle.

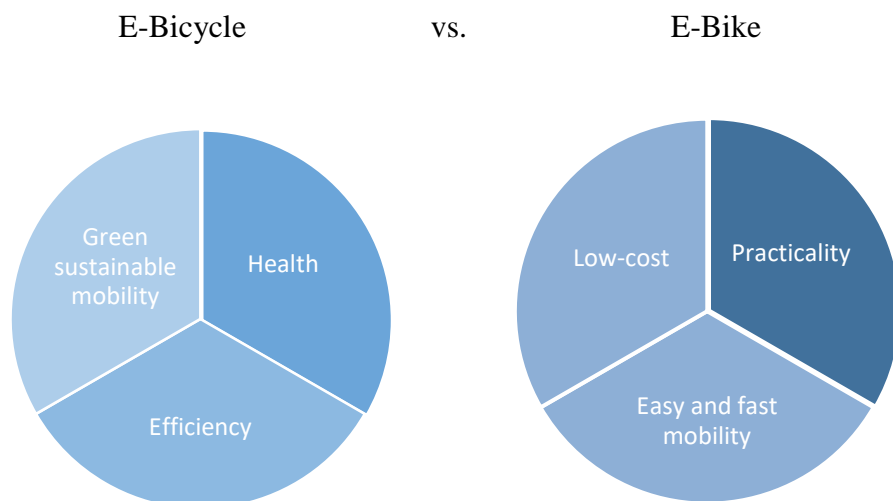


FIGURE 8. The difference between an e-bicycle and an e-bike

E-bikes vs. e-scooters

Both are relatively similar in size and both are an attractive mode of transportation, however in Taipei Gogoro and CMC already produce e-scooters and are a success. The success of the e-scooters from 2002 to 2012 grew and made it clear that the market is ready for these “new electric miracles”. (E. Hicks. November 4, 2012) E-bikes are now entering the market when there has been an increase in the demand for alternative solutions for e-scooters. However, it seems that the current situation benefits more the seller’s than the buyers. This will probably change soon. (E. Hicks. November 4, 2012)

Electric scooters used to be way cooler than electric bikes, and companies were focusing more on them, however now there are some major changes to that perspective. (E. Hicks. November 4, 2012) Here are few similarities between e-scooter and e-bikes:

- Both are easy to use, small lightweight electric vehicles.
- Both are alternative modes of green transportation.
- Both are semi-legal motor vehicles.
- The new lithium battery technology benefits both. (E. Hicks. November 4, 2012)

This thesis focuses on the e-bikes, however, in the next chapter there will be a comparison between the e-bikes and the e-scooters

E-bike

- E-bikes are protected by federal law, which states that they are not motor vehicles. This means that it saves the trouble of getting licenses.
- E-bikes are protected by the bicycle coalition.
- Larger design. The style can be sportier, attracts more for the off-road drivers.
- Can be tuned to be as or even faster than the e-scooters.
- The aim is to have them for longer distances; you would not travel 200km with an e-scooter.
- For off road performances and customisation
- Electric bikes have many interchangeable parts. (E. Hicks. November 4, 2012)

E-scooter

- Electric scooters are simple design wise, with less parts.
- Electric scooters are more compact and transportable.
- E-scooter market already exist strongly in Taipei; this is the main reason why it is not the focus of this thesis.
- Safer in case of an emergency on the road
- Electric scooters and e-bikes as well, are easy to mount and dismount. (E. Hicks. November 4, 2012)

3.3. E-bike market strategy

Below is the projectile for the possible e-bike company. It shows the direction to where the business should go to. It is based on the important factors of the business and to which direction they should advance.

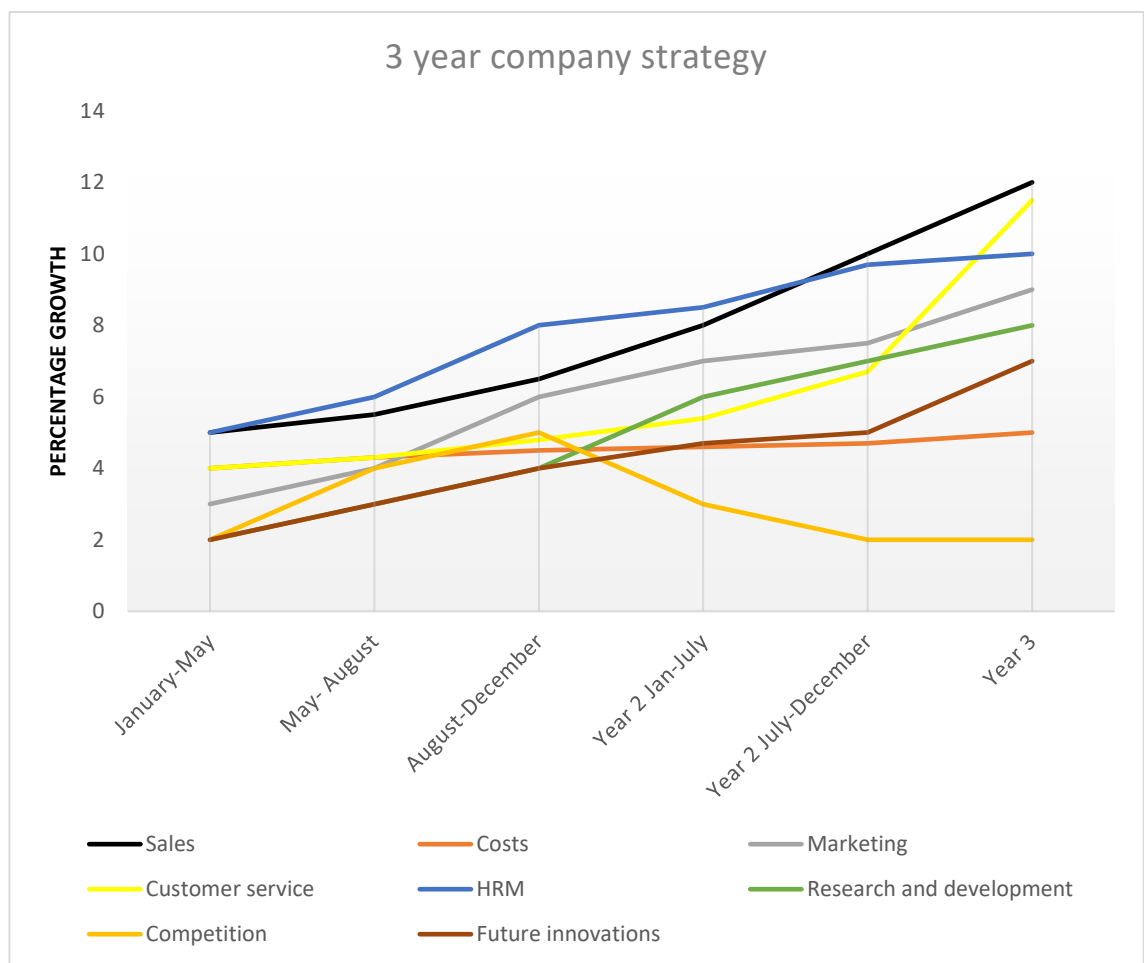


FIGURE 9. 3-year company strategy projectile (V. Metsäranta 2018)

The figures are estimates of the future of the business. The graph illustrates that business and investment should grow hand in hand. The core idea is to increase sales while not increasing costs as quickly. Customer service will be more important every year and the business idea is developed around customer services efficiency. Competition can emerge in the beginning, however having a better strategy and eliminating the competition with the right partners will give the required edge for market dominance.

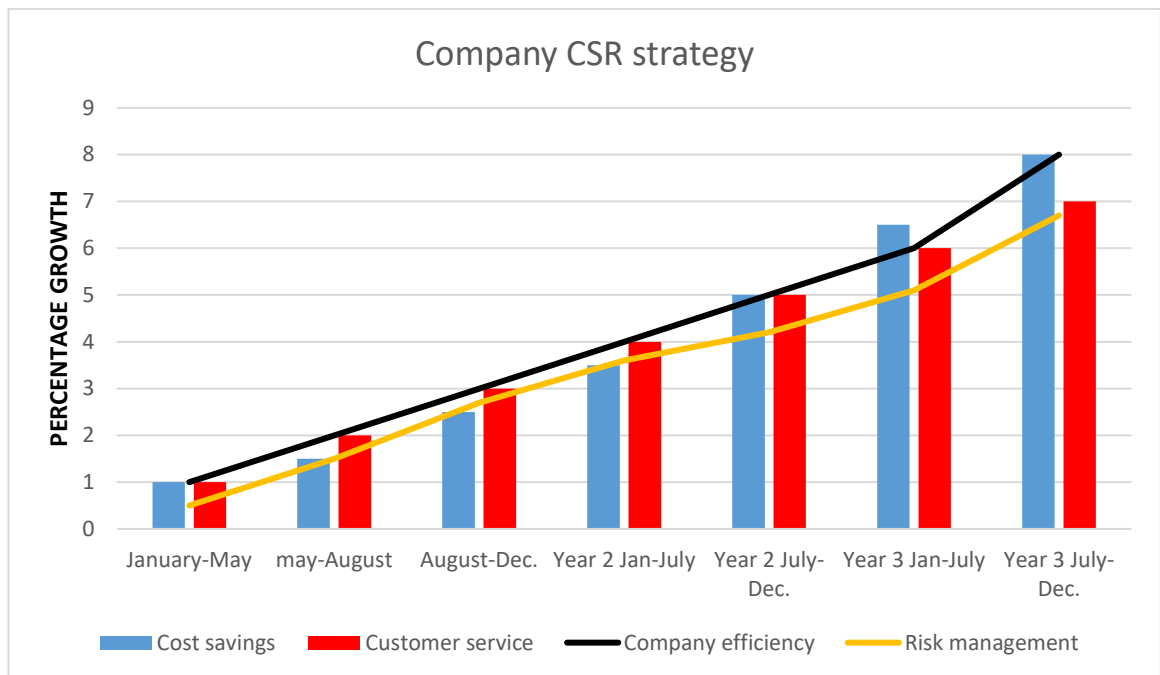


FIGURE 10. Company CSR strategy projectile for first three years (V. Metsäranta 2018)

The Graph above shows the three-year plan for companies CSR strategy for e-bikes. The graph shows the development process of cost saving, customer service, company efficiency and risk management. The aim is to reduce costs and start with efficient plans to avoid any unnecessary cost and in seven years to have high rate of cost savings. These are just the few things that the companies CSR will consider. The better these areas are mastered in the company for e-bikes, the better results it will conduct for the company and guarantee a better company structure.

Cost savings in manufacturing the e-bikes: In the seven-year plan, it is important that the cost savings are managed. For example, if there is a surplus in the e-bikes or the wrong model is being produced too much, it will have a negative impact to the company.

Sometimes getting an updated machine that save in the labour costs pay themselves in the future. Many companies fail when they do not have a plan how to reduce all unnecessary expenses. The expenses may consist of high logistics costs or unnecessary legal costs that could be reduced by an accurate plan. (K. Väisänen 2018, 75-104)

Customer relationships/service for e-bike consumers: Maintaining stable, long lasting and efficient customer relations is the core of the e-bike business. If there would not be any customers, the company could not work. Once the customer service has reached the adequate levels, it will increase the profitability and sustainability of the company. If the customers find that this company is the best provider of the current product, they will prefer it to other alternatives. Efficient customer service is the key for success. The customer must remain satisfied in order to have a long and healthy relationship with them. This is achieved by having a long lasting, honest and open relationship with the customers and customising an efficient and unique experience that will make the customer want to invest or buy more.

Efficient e-bike risk management system: It aims to predict how to monitor, secure, minimise and control the outcomes of the business. An effective risk management can secure the company's future and avoid bankruptcy. In case of an unfortunate event, it will minimise the damage and maximise the realization of the opportunities. It can be divided in to three different steps:

1. Identification of the legal e-bike risks.
2. Assessment of the possible risks for high costs during sales or the production.
3. Prioritisation of the risks (if the company is faced with unknown political risks such as a new license law for e-bikes, they tend to be more serious than user related risks).

3.4. Global e-bike industry analysis

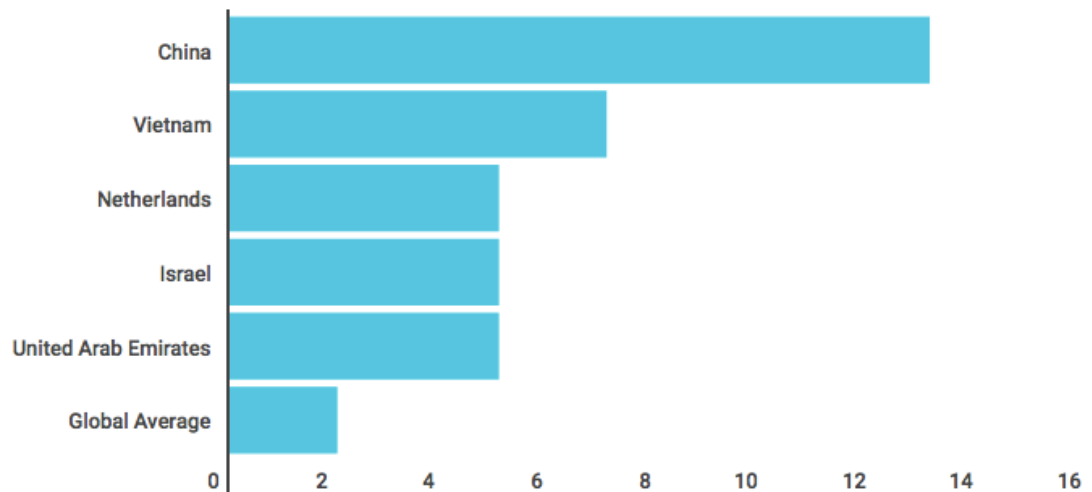
In the previous years, there has been a lot research and development in the global electric bike market. The aim is to increase the electric bike business and ultimately increase the market share. In an attempt, to make the e-bikes more attractive to the public, manufacturers aim to enhance the performance of the e-bikes. This is made possible by new techniques and by using alternative raw materials. (Market insider 2018)

Health awareness among the people is the main reason for the growth of the need for electric bikes. Pacific excluding Japan is expected to hold more than 4/5th of the global market throughout the period of forecast. (Market insider 2018) The threat of the global warming forces countries all around the world to react. The emission levels must be reduced by at least 50%. (C. Herweijer 2018)

The global electric bike market is expected to grow at a steady rate and is forecasted to reach CAGR of 3.1% during the period of 2017 to 2027. (Market insider 2018)

Top 5 Users of Electric Bikes

Percent of population who have used an electric bike in the last month



Based on a census-representative survey of 43,034 people across 52 countries completed in February 2017 by Dalia Research.

FIGURE 11. Top five users of e-bikes in percentage (J. Sammy 2017)

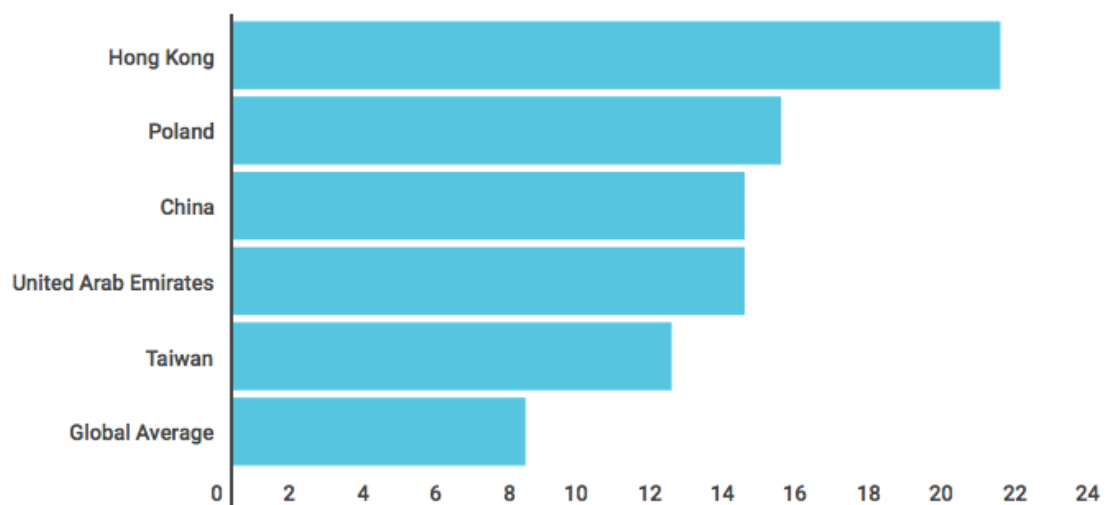
In the figure above, it shows that China and Vietnam are the two of the biggest users of e-bikes followed by Netherlands and Israel. This shows that there is a market in Asia and other countries should also start using these climate friendly solutions. (J. Sammy 2017)

The market for e-bikes is growing, since China is battling with climate change and many other countries will follow this trend soon (C. Buckley May 30, 2016). Even though the global average is now low, it will increase, because it is seen around the world, that the urbanization will continue to grow and the cities must react to this with their infrastructural changes. This means that there will be less space for big cars and other vehicles. An e-bike would be a perfect solution for tight spaces.

Taiwan serves as a perfect market, since the bigger cities are filled with scooters that still run with oil. This means that there will be a major change in the policies concerning the e-bikes. Soon Taiwan must react to the changes and there will be a shift to greener solutions. (MOTC 2018)

Top 5 Users of Bike Renting Services

Percent of population who have used a bike renting service



Based on a census-representative survey of 43,034 people across 52 countries completed in February 2017 by Dalia Research.

FIGURE 12. Top 5 Users of Bike Renting services in %. (J. Sammy 2017)

The other figure above shows how the market is strong in Asia for bike renting as well. Taiwan is the fourth biggest user of bike rentals. This indicates that not only the selling of e-bikes, but also the renting services are a profitable business. The areas near Taiwan such as Hong Kong indicate also the possibility of Taiwan having a huge increase in the market of e-bikes.

The renting is also a major part of the market. For many people, especially tourists, it is always more convenient to rent a bike/scooter than to buy one. Gogoro's business plan is to sell scooters in Taiwan and to rent them out in Berlin and Paris. Maybe in the near future they will change into the direction of renting them as well in Taiwan and selling them in Europe vice versa. (Gogoro Inc. 2018)

Renting e-bikes is a better business in bigger cities and areas where there are relatively short distances between other cities and villages. This makes it more convenient and easy for the public to use them. Even though Asians might not value the exercise part of biking, they will still enjoy the fresh air that is the result of emission free solutions. (Bicycling in Asia 2008, 27-33)

3.5 E-bike business structure

When entering a new market, there are countless of factors that might intervene with the possible entry. Below are the key factors to consider when entering a new market. (Martin May 28, 2014)

The right country or region: Taiwan is a growing nation and shows a lot of promise in the future of CleanTech. They are currently investing millions of dollars to the CleanTech sector and are not planning to stop anytime soon. (Wang April 20, 2011) The Company must identify where the demand is strong and the supply is weak. (Martin May 28, 2014)

Cost: What is the labour cost and the variable cost? Does Taiwan have a high tax? Are there import costs that you need to consider? Are there any hidden costs that may emerge later, such as environmental costs from CO₂ emissions? There might be some changes in the legislation system?

The people: Try to understand the need of the Taiwanese people and the way they consume. You would not sell them big cars if the whole infrastructure is built on smaller vehicles. What are their tastes? What do they like to buy? How much they consume per year for products and services?

Competition: The success and the failure of the existing and previous companies. Are there high barriers to enter or possible co-operation/partnerships? Is the best way to begin from scratch or try to use a penetration market strategy?

Challenges: Know the target audience and the environment, however keep in mind what could work and what not. Gogoro saw a business opportunity in Taiwan in electric scooters and they succeeded. (Gogoro Inc. 2018) Keep an open mind and be prepared to react to shifts in the market. (Martin May 28, 2014)

3.5.1 Segmentation

Segmentation is the key part of the marketing plan, since it determines what is the population that is targeted and what should be the methods used in marketing it to the current segments. These three steps will provide the core direction for the segmentation:

Segmentation > Target marketing > Product placement

(J. van Rijn 2017)

In marketing there are several things that have to be taken into consideration. Without a careful analysis the product might not appeal and might be a flop if the target populations are wrong. The four main market segments for e-bikes are as follows:

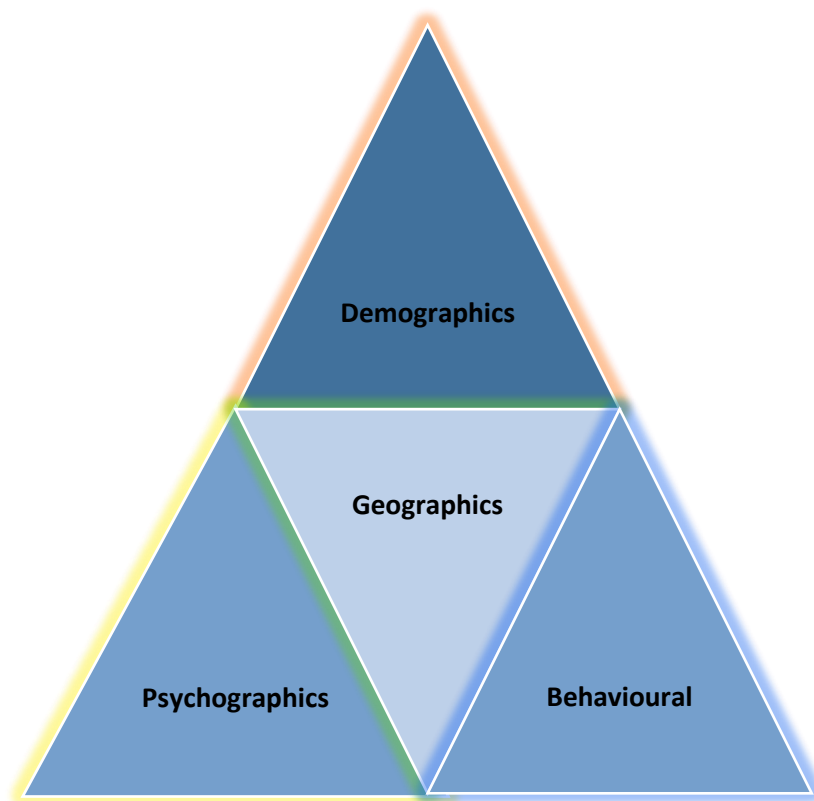


FIGURE 13. The four main parts of segmentation

The figure above illustrates the four main targeted segments. Below are the same ones described in more detail:

- **Demographics:** The age gap for the e-bike users is around 15-70. This is since 15 should be old enough to drive it and after 70 it might be already quite dangerous to be a driver. When the e-bikes are stable and lightweight, it makes it easier for older people to use it as well. People who have an average income tend to be

more able to purchase e-bikes. The aim is to make the e-bike prices low enough that even the lower income people can buy it. How cheaply can the e-bikes be produced for them to be affordable for everybody? Gender and social status should not matter at all. For the families that are looking for a vehicle that they can take their other family members with, the e-bike would not be the best solution. One idea would be to build a seat large enough to carry more than one person. (See Appendix 14. for the age distribution in Taiwan from 2008 to 2016) This graph shows what percentage of the people are the ones that are targeted for the e-bikes. 73,46% of the population (age 15-64) in 2016, falls to the segmented category. (Statista 2018)

- **Geographic's:** This is an important issue, since it matters where the e-bikes are being used. It should be made possible for the e-bike to be available all-around Taiwan and connect the outer cities to Taipei. This would be possible, if the batteries are made to last long distances. Taiwan is a relatively small country which has a high-density population in Taipei, but does not have that many people living outside it. Taiwan belongs to sub-tropical climate zone with a tropical climate zone in the south. Winters are warm and summers are hot and humid. The annual average temperature is a comfortable 22 °C, with lowest temperatures ranging from 12 to 17 °C (China highlights 2017)
- **Psychographics:** Every person has different lifestyles. Some people like comfort and others seek danger and fast experiences. E-bikes provide these qualities to their customers since they are not limited in their performance. It also enables people with different interests, values and attitudes to get what they want. On one hand, a Taiwanese family is looking for a comfortable and safe model for the mother and on the other hand the teenage boy of the family might be looking for a model that is dangerous and fast.
- **Behavioural:** The behavioural aspects are the ones that are mostly the benefit sought, purchase usage, life cycle stage and user status. Some people need an e-bike for the family and others want it for private use. The younger generation prefers more the performance and the outlook whereas elderly people want more practicality and safety. Status is a trickier part, since some people think having a stylish e-bike might be rather important for them whereas some do not think anything more of it.

Conclusion: The main target population for the e-bikes are the people from 15-64, middle class people with no more than one child.

3.5.2 Infrastructure

The graph below illustrates the amount of motorcycles currently in Taiwan. This shows the vast market opportunity of smaller vehicles such as e-bikes, e-bicycles and e-scooters.

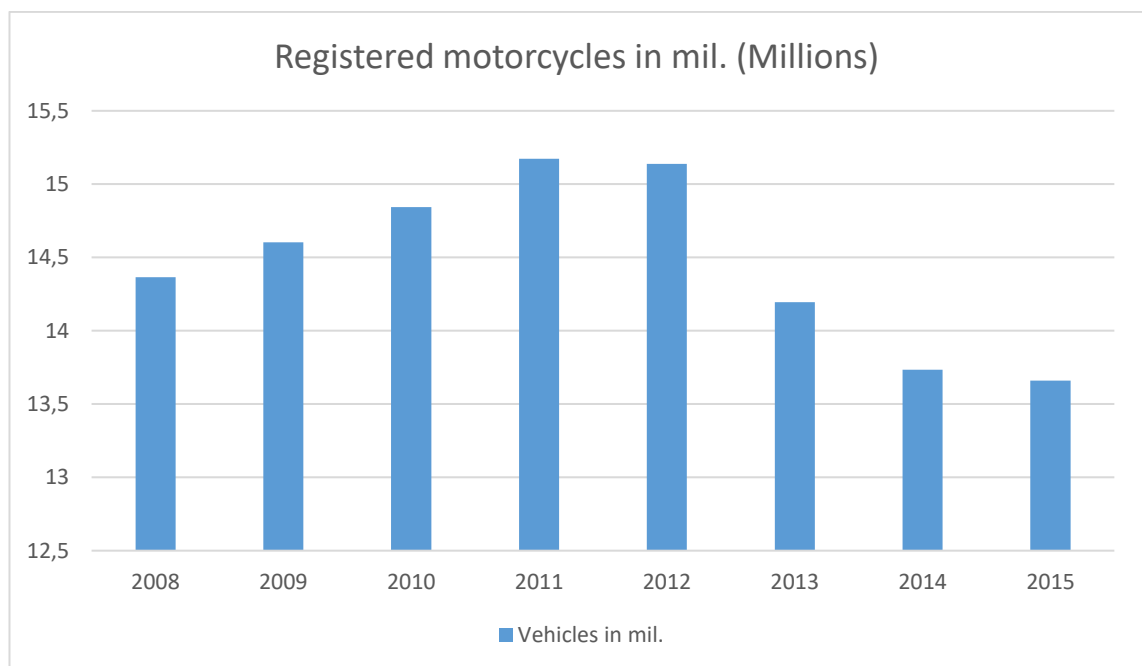


FIGURE 14. Registered motorcycles in mil. (Taiwan statistical book 2016, 134-137)

The registered motorcycles have a strong correlation with the potential e-bike market. The demand can be forecasted as high, if there is an efficient marketing strategy that will make e-bikes attractive enough for the population.

Even though the numbers have decreased, the market size is still big and there are many ways in which the promotion can increase sales. The market for the e-bikes is growing even though the growth of motor vehicles has decreased.

Additional information about the percentage of motor vehicles present in the metropolitan area in Taiwan is stated in the (Appendix 10.) It illustrates how many motor vehicles are

on the roads and what is the percentage of motor vehicles of the total traffic. The amount has increased over the years, however as more of the e-vehicles enter the market, their numbers will increase.

3.5.3 E-bike legislations and laws

The ministry of transportation and communications R.O.C (MOTC) is currently building the future in Taiwan. MOTC has planned that Taiwan would improve and focus on the major points listed below. (MOTC 2018)

- **Promote clean energy and humanistic transports**, improve pedestrian and bicycle users' environment, promote low-carbon energy-efficient transports and protect the environment, promote green transport while achieving humanistic transportation.
- **Safe transportation network**, ensure a high-quality living environment with a sound intercity urban transportation, complete infrastructure; based on transportation service characteristics, strengthen safety management mechanism, reduce disaster risks and accident rates; combine intelligent transportation technology to provide reliable service.
- **Tourist-friendly environment**, enhancing balanced regional economic development and optimizing tourism quality; externally, strengthening Taiwan's tourism image and improving travellers' experience.
- **Meet the diverse needs of the customers**, providing excellent and universally trusted service: provide universal, fair, and reasonable service, support major national economic construction projects and promote the public interest.
- **Long-term technology capability plans**, provide sophisticated and diversified meteorological services: sophisticate life in townships, enhance social awareness of climate changes. (MOTC 2018)

Electric bike legislation in the UK in comparison

The law in the UK requires electric bicycles to reduce the power supplied by the motor as the bike's speed approaches 25km/hour (15mph). This does not mean that you cannot go faster than that, but you are going to have to do it under your own steam. (A2B 2018)

The requirements are:

- The bike must have pedals that can be used to propel it.
- The electric motor shouldn't be able to propel the bike when it's travelling more than 15mph.
- The bike (including its battery but not the rider) must not be heavier than 40 kilograms (kg).
- The motor shouldn't have a maximum power output of more than 250 watts.
- The bike must have a plate showing the manufacturer, the nominal voltage of the battery, and the motor's power output. (A2B 2018)

Government intervention

Increasing government subsidies and incentives on the purchase of electric bikes, thereby attracting more customers. (Market insider 2018)

The need for electric bikes has emerged as an alternative to fuel operated vehicles. They are considered as a clean technology and the future way of travelling.

The reason for the increase in the attractiveness of an e-bike:

- Rising fuel prices and never-ending demand for fuel.
- Increasing purchasing power of consumers and the need to travel fast and easy.
- Reduction of the air pollutants as compared to conventional vehicles.
- Increased health awareness among people.
- The growth of the electric bike and bicycle segment, which is expected to grow at a higher CAGR of 3.3%. (Market insider 2018)

The government of Taiwan introduced the renewable energy bill in 2009 and set a new renewable energy target that should be reached by 2025. The Taiwanese parliament passed the renewable energy bill, which is responsible for the installation of between

6,500 and 10,000 megawatts of renewable energy capacity in Taiwan. The bill is expected to provide more than \$900 million in renewable energy investment to the country. This bill tries to reduce carbon dioxide levels to its 2008 levels. This will also increase the jobs in clean energy sector. (Wang April 20, 2011)

The target of Taiwanese government is to have 16 percent of all installed power capacity generated from sources of renewable energy in the year 2025. (Wang April 20, 2011) The energy sector will grow and develops as the demand changes and grows at the same paste.

In 2010, the government introduced a General Plan for National Energy Conservation and Carbon Reduction. IT consisted of 10 objectives of the General Plan for National Energy Conservation and Carbon Reduction. These were the lowering carbon emissions by 2025 to 2000 levels, boosting regulatory framework, development of a low-carbon emission industrial structure, low carbon energy society, promotion of energy saving and increase in carbon reduction and energy conservation education all around Taiwan. (Wang April 20, 2011)

These plans show promise for the future and enable the support of new technologies that promote low carbon solutions. The introduction of an e-bike could support these plans and investments in Taiwan.

3.5.4 E-bike costs and benefits

Most of the world is having trouble understanding electric cars, because of the dominance of the petrol cars and the power of the oil companies. The cost for a kilowatt-hour in an electric vehicle is low and a higher kilowatt-hour does not necessarily mean a higher cost. For example, a 100-watt bulb burning for 10 hours is a kilowatt-hour and in the United States, it costs \$0.10 for a kilowatt-hour. (J. Turner 2013) In comparison if you have an electric bike with a 500-watt motor, it runs for two hours on one kilowatt-hour of electricity and the cost is \$0.10. If the e-bicycle goes 20 mph, the cost for 40 miles is \$0.10. The reason why people have trouble understanding the benefits of an e-bike is the fact that it will be cheaper in the long run. The problem is the costs, which is easier to comprehend than kWh. (J. Turner 2013)

Most cars go for 40 miles, which uses two gallons of gasoline with the cost of around \$4.00 a gallon, together being \$8.00. In comparison to the electric bike, which costs \$0.10 to go for 40 miles. If you pay \$8.00 for gasoline in the car, you only pay \$0.10 in electricity for an electric bike for the same distance. Twenty-five people travelling for 40 miles by car for \$8.00, could travel 3200 miles on an electric bicycle. (J. Turner 2013)

The prices for gasoline could rise at any moment and this could be devastating for many households, so the e-bicycle or e-bike would be a safer option since it is not correlated with the rising gasoline prices. Most electric cars use about 1/3 to 1/2 the amount of energy in terms of costs. When filling up a Tesla car, the cost is only \$12 versus \$40 or \$50 if it were a gas car. The price difference is significant. (J. Turner 2013)

3.5.5 Environmental impact

Environmental issues are a legal and marketing concern; however, this part comes after the product is ready for launch and the business image is perfected. The environmental impacts of an e-bike are the decrease in the usage of polluting modes of transportations and the increase of space since cars take more space not to forget the parking. It will make the infrastructure more clear and clean and pave the way for a green future.

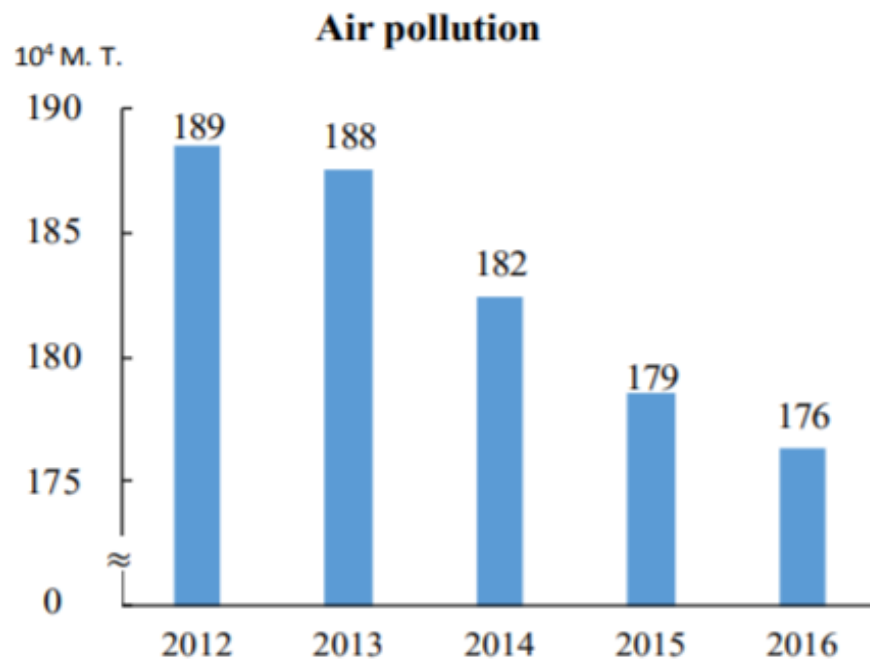


FIGURE 15. Air Pollution in Taiwan from 2012-2016. (National Statistics, Republic of China (Taiwan) 2018, 2-3)

The figure above shows how the air pollution has decreased in Taiwan and the government has taken initiatives towards green energy. This enables more environmentally friendly products and services to emerge in the Taiwanese market. In 2016 the pollution has decreased to 176 metric tons and it is forecasted that since there are several new investments towards CleanTech, the numbers are going to decrease even further.

This thesis will focus more on the value that the e-bike will give to its customers and the profits that it grants to the company. The Asian way of thinking shifts the focus away from the health and the climate part, while focusing more on the cost and the practicality

of an e-bike. (Bicycling in Asia 2008, 27-33) (See Appendix 11. for the amounts of pollutions motorcycles produce.)

3.5.6 Safety

There are certain things the drivers must take into consideration when driving an e-bike. It is more dangerous than a car since you do not have the protecting layer of the car around you and it is much quieter than a normal motorcycle. The key selling point in the e-bikes are its easy way of travel, the comfort and a silent motor. However, the safety factors might not always appeal to the customer in the way it is forecasted. Some young people might have the opposite reaction to its appeal if it is too safe and they are looking for something that is more dangerous and cool.

Fatalities and accidents

The two images below show the overall fatalities and accidents that have occurred in the time of 2008-2016.



FIGURE 16. Number of fatalities in Taiwanese road traffic from 2008 to 2016 (Statista 2018)

The number of fatalities have decreased. This means that is safer to travel in Taiwan and when the numbers decrease even more, there might be a significant increase of the e-bike sales.

There are always dangers of riding a bicycle, a motorcycle or an e-bike. There is a list of the main dangers that the e-bike drivers might face (See Appendix 2.). These apply to people riding high-powered electric bikes capable of high speeds. (E. Hicks. July 26, 2012) An electric bike goes faster than a regular e-bicycle; however, it is still relatively slower than a motorcycle even though recently the e-bikes have been made faster than before. (E. Hicks. July 26, 2012)

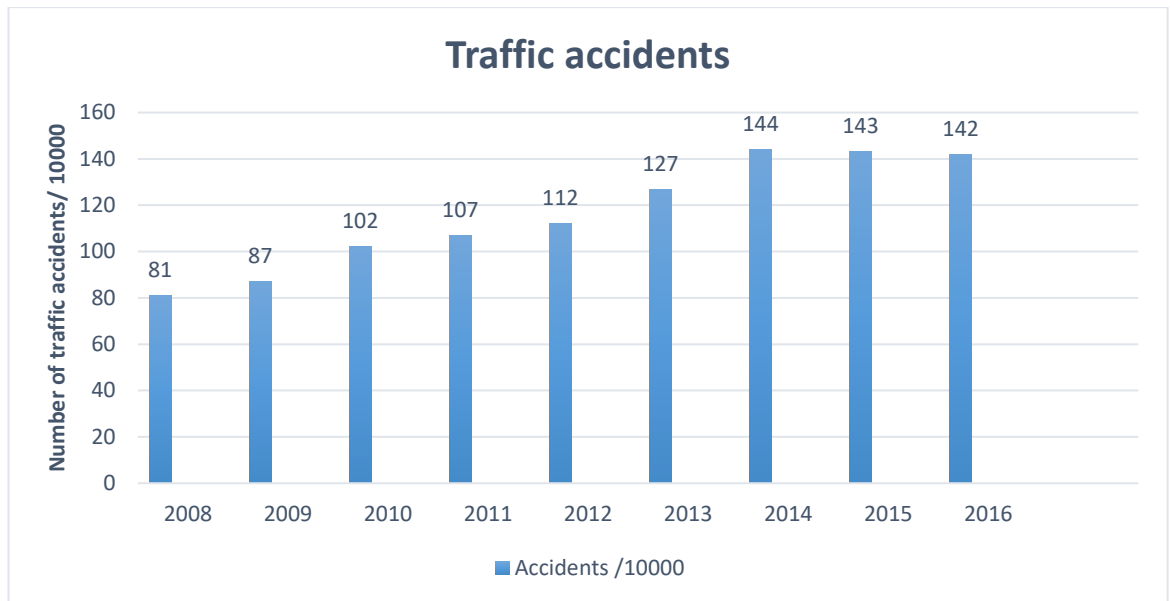


FIGURE 17. Traffic accident rate of motor vehicles in Taiwan from 2008 to 2016 (accidents per 10,000 vehicles) (Statista 2018)

This means that there should be some safety protocols for the e-bikes, since they are part of the traffic and are easily affected by the risks that comes with it. Seems that the numbers are slightly decreasing, however they are still relatively high.

3.5.7 Free trade agreements

Taiwan has been a WTO member since 2002; however, there are still mane problems and concerns that Taiwan will face. Trade between the EU and Taiwan has been increasing; however, the EU has a trade deficit with Taiwan, which can be a concern in the future. (European commission 22 February 2017)

Trade with EU:

- The EU is Taiwan's fourth biggest trade partner after China. Other big ones are U.S and Japan. In 2016, EU imported 26.1 billion€ worth of goods and exported 17.0 billion€.
- EU's position as important industrial supplier for Taiwan's industry is significant, since they had trade of services worth of 3.3 billion€ and in export area 4.6 billion € in 2015. (European commission 22 February 2017)
- Transport equipment are by far the most traded commodities between the EU and Taiwan. This enables expansion for the EU market when the time is right. Taiwanese import of services from the EU are dominated by transportation sector. (European commission 22 February 2017)

Mainland China is Taiwan's largest trading partner, accounting for 23.07% of total trade and 19.07% of Taiwan's imports in 2016. The United States is Taiwan's second largest trading partner, accounting for 12.15% of total trade. In comparison Taiwan is the 10th largest trading partner with USA. Following the U.S. in terms of overall trade are Japan (11.77%), Hong Kong (7.77%), and South Korea (5.37%) (Export gov. 2016)

Chinese market

China has increased the import of e-bikes to Europe. There are estimated 800.000 in 2017, according to the European Bicycle Manufacturers Association. (Kottasová 2017)

Chinese government subsidies in the e-bike sector allows its manufacturers to sell the e-bikes in Europe for less than they cost to produce. This makes Chinese e-bike highly attractive in the European markets. Chinese e-bikes costs \$450 in Europe, while competitors have ones that cost \$1,500 to \$2,000. E-bikes that are powered by batteries are still quite rare in Europe. However, they are a huge business in China, where sales were more than 30 million in 2016. There are now between 150 million and 200 million e-bikes on Chinese roads. Global sales of e-bikes are expected to increase from \$15.7 billion in 2016 to \$24.3 billion by 2025, according to Navigant Research. (Kottasová 2017)

4 E-BIKE MARKET RESEARCH

This chapter will go in depth with the current manufacturers and operating companies around the world for motorcycles, scooters and ATVs. First chapter consist of the competitors around the world and the second will handle the ones that currently operate in Taiwanese market and are threats or possible partners.

4.1 Mode of transportations in Taiwan

In Taipei, it is common for people to own a scooter. It is the most used mode of transportation and it will continue to dominate the markets in the future as well. The infrastructure and the roads themselves are designed for the scooters. The scooters have their own stopping space, which is in front of the cars. This means that the scooter always can move before the cars. It is forecasted that the electric scooter segment is expected to show moderate growth. (Market insider 2018)

Gogoro

Taiwan already has existing electric scooters, which one of the most successful one is the company called Gogoro. Horake Luke and Matt Taylor, whom had big plans of making Gogoro a worldwide know brand, founded the company in 2011. Currently the company is growing fast and has plans of expanding outside of Taiwan. (Gogoro Inc. 2018)

Driven a Gogoro scooter myself, the experience as pleasant and since Taiwan has the largest amount of scooter per capita, it is safe to say that Gogoro will continue expanding in years to come and increase from their 4% market share to the dominance of more than 50%. This will take time; however, the increase of the knowledge on climate change might push faster to their goals. (Gogoro Inc. 2018)

Gogoro came out with a new electric scooter called the Gogoro 2 Smart scooter. They aimed at to have twice as cheap and faster Gogoro. This was made possible by the effective engineering team that worked day and night to provide more attractive solutions for emission free transportation. (S. O'Kane May 24, 2017)

China Motor Corp.

China Motor Corp. is a local rival to Gogoro Inc. in Taiwan and produces efficient electric scooters to the market. CMC was founded in 1969 and is headquartered in Taipei City, Taiwan. CMC manufactures and sells mostly commercial vehicles in China. The company is known to export its light commercial vehicles to Asia, the Middle East, and North Africa. (Bloomberg 2018) These two brands are the biggest in the electric scooter industry in Taiwan and other companies find it hard to compete with them.

CMC developed a safer lithium battery to their electric scooter, which hit the market. The lithium battery is safer in event of a collision as it will not catch fire, company president Jim Cherng said at a press conference. “The battery weighs 9.5kg, 6.5kg lighter than its predecessor, and is half the size of other lithium batteries”. (C. Kao 2013)

CMC currently enforces its presence in the market since they also have realized that electric scooters are the future. If Gogoro and CMC continue this battle and both want to be the biggest one in Taiwan, this could end in a positive result. The mass change of gasoline scooters to the electric ones. The approach could be that either of these two companies could provide with a cost-efficient solution to a new mode of transportation. However, if the products are too different from the scooters, there might not be any kind of market interest for these companies to target another market.

4.2. Manufacturers in Taiwan

Below are the competitors that are directly operating and manufacturing in Taiwan and producing motorcycles.

The AEON Motor Company was established in Taiwan in 1997 and originally produced ATVs and scooters. These were done under its own brand and the engines under the license of other companies. Eventually it decided to only focus on the ATV market. AEON employs more than 450 workers and the productions outputs were around 40.000 units in year 2004 and in 2005 over 75.000 with a continuing growth. Maximum capacity annually is around 120.000 units. The ATVs are for all age groups and provide an easy and steady ride. The quads range from the Minikolt 50cc to the 100cc Cobra. (AEON Motor CO 2016)

Even though AEON concentrates in ATVs, it can still be considered as a competition, since they have a knowledge of the market and they can start producing 100% electric versions of ATVs. They can also be considered as a partnership, since they have existing foothold in Taiwanese market. In the recent years, they have achieved the following:

2016,

- Guinness world Record with the biggest scale of 3-wheel motorcycle parade
- YUSHAN Award
- Achieved the 24th Taiwan excellence Award and Gold Award

2017

- Cooperation with KAHARA, Japan for co-branded scooter ES150 EVA
- Elite300 E received 25th Taiwan Excellence Award and Silver Award
- 25th Taiwan Excellence Award for OZS150
- 4th Outstanding Backbone Enterprise Award (AEON Motor CO 2016)

CPI Motor Company was founded in 1991 and it has turned into a competitive and long-lasting manufacturing company after going through reformation. The letters stand for collaboration, professionalism and innovation. Producing high quality, updated and tuned integrations with meeting the necessary requirements of the customers and standards of

ISO 9001: 2000. (MOTORBIKELinks 2015) CPI aims to guarantee efficiency, cost competitiveness, productivity and quality. With their technological advanced products, they aim to be aware of the changes in the market and provide new and practical solutions for the customers.

CPI has a fully integrated production system that works for the whole production line. They are one of the first companies to have a production base in the Peoples Republic of China. The automated system guarantees CPI group incomparable efficiency in productivity, cost and quality. (CPI Motor Company 2010)

KYMCO is a global leading brand that delivers and produces motorcycles, scooters, ATVs and some utility vehicles, which gives it a broad range of market share it can attain.

KYMCO focuses on bringing customers the most comfortable and thoughtful driving experience. It has a mission to build custom made products that are made to the customer's desires and thoughts.

KYMCO launched a new service they call Noodoe Navigation that allows riders to have better focus on the road. The service is a rider first approach in navigation. This application allows the riders to focus on driving and not to look at their phones while they are driving. This is a safety measure that decreases the accidents that are caused by violation of keeping eyes on the road. Noodoe is a social network platform, which everyone can create and share. An international social network where bikers can communicate with other drivers. (KYMCO 2018)

“High-End Electric Vehicles & Heavy Bikes on Display at TWTC Exhibition Hall 1 Starting on April 20, 2017” (Taiwan Motorcycle 2017)

PGO Motive Power Industries (MPI) focuses constantly on delivering quality products, while being environmentally responsible during the manufacturing and after (PGO Motive Power 2011) PGO has its own green power generators in which they tend to increase the output.

PGO and the Motive Power Industry brand was founded in 194, Taiwan. PGO used to be partnered with Italian scooter manufacturer Piaggio. In 2006 China development, Industrial Bank invested in PGO. The company's core competences are around the design, sales, quality and procurement.

- **2010**, Three new models, X-Hot 150 EFI, G-Max 220, and E-Hot, 18th annual Taiwan excellence award.
- **2011**, Tigra 125 liquid cooling model, 19th annual Taiwan Excellence Award.
- **2012**, Brand new fuel injection model (JBU 115) and ROBUST oil cooling technology (PGO Motive Power 2011)

SYM (Sang Yang Motor) founded in Taipei 1954, manufactures and sells motorcycles, ATVs and scooters in co-operation with Hyundai. They also produce automobiles and minitrucks. The company has produced around 16 million scooters and motorcycles and operates in Vietnam, Taiwan and China. Annually the company's revenue reaches 1 Billion US dollars. SYM produces 600.000 units of motorcycles per year. SYM has

around 2.300 people working in Taiwan. (SanYang Motor 2010) SYM has a vision to provide excellent products and services while winning the loyalty of the customers and fulfilling the responsibilities of the environment and society. They aim to perfect the customer satisfaction with a fast-global expansion while focusing on high quality.

2016

- Magic SR, 125cc scooter launched in China
- Shark Mini, a new 115cc scooter was launched in Vietnam
- Woo, new 125cc scooter
- Maxsym 400i, a new 400cc scooter
- Amigo 50, a new 50cc cub motorcycle
- Received Chinese High-Tech Enterprise Certification from Xianmen government.

2017

- new 125cc scooter and a new 125cc bike
- Zero resistance Starter & Generator system (ZRSG) was launched
- SYM Z1 passed the Sixth Phase of Petrol Vehicle Emission standards
- SYM Jet 14 was launched
- Xiashing Motorcycle celebrated its 25th anniversary. (SanYang Motor 2010)

TGB (Taiwan Golden Bee CO. LTD) was founded in 1965 as Vespa and went global in 1978 and changed name to TGB. TGB specializes in ATVs, engine kit manufacturing and scooters. The company has years of excellent production experience and provides high level of quality worldwide. TGB aims to have long lasting customer experience and satisfaction while becoming one of the leading power sports brands. In conclusion, the company's focus is on enriching drivers unique and enjoyable driving experience. (TGB 2009) The main markets outside Taiwan are USA; Europe (France, Germany and Italy) and Japan.

2014

- Own advanced electronic power steering and assembly of wide range of its models. One year before the entrance of models 300-500cc class.
- Power steering models, competitive edge

2015

- TGB 1000 model was released, flagship quad bike with the largest engine of Taiwanese market.
- TGB has achieved production quality management standards ISO 9001 and QS 9000. (TGB 2018)

Gogoro is also one of the biggest competitors as already listed in the chapter 4.1. Currently they aim to conquer the market with their new GoCharger Mobile service for drivers. (Gogoro Inc. 2018) They also focus on more the battery technology and try to provide the best batteries for the e-vehicles in Taiwan and other major cities like Paris, Berlin and Madrid. (Gogoro Inc.) See chapter 4.1 for additional information on Gogoro.

Gogoro is one of the most influence company in the Taiwanese market for e-scooters and a potential partner or a threat. However, Gogoro focuses on the new battery technology and charging applications, which might serve as a potential partnership for the e-bike company. (Gogoro Inc. 2018)

4.3. Competitive analysis

The image below shows possible competitors for e-bikes. The categories are listed below according to the country, name, market area, size, price, power range, style, advantages and disadvantages of the company.

Name of the CO.	Country	Market area	Size	Price and cost	Power range	Style	Advantages	Disadvantages
A2B	United States	Asia, Europe, United states, Australia	Big in UK	1700-3800\$	250W, 350W, 500W	Standard, Urban, commuting	Balancing comfort, speed and design	Asia market (Japan, Korea only)
Aerobic cruiser	United States	United States	Middle	5000\$	750W	Comfort	Comfort and long-term performance	Low variety
Ariel Rider	United States	Europe, Asia, Africa (26 countries)	Small	1900\$-2900\$	500W, 550W	Vintage	Awarded for Green business seal	One model
Mando	South Korea	Europe, South Korea	Middle	2700-3900\$	250W	Futuristic, compact	Expertise over 50 years	Focus on auto parts market
Trek	United States	United States, Asia, Europe	Big in USA	2300-5000\$	250W, 500W, 750W	City bike, cruiser	Many manufactures around USA	Relatively expensive
Riese & Müller	Germany	Germany, Japan, USA	Middle	3900-11000\$	250W, 350W,	Urban, high-duty, suspension	High-quality	Expensive
Halfords	UK	UK, Netherlands	Big	500-3300€	250W, 500W	Foldable models	Cheap, flexible	Model might not be comfortable
Volt	UK	UK	Big in UK	1300-3000€	250W	Fold, Step through	Full range of bikes	Market area only UK
eZee Kinetics	China	Asia	Middle size in Asia	1700-3500\$	300W	Mid-drive	Big variety of e-bikes, e.g. Folding e-bike	Focused market
Geoby	China	Asia	Big in China	400-800\$	250W	Generic e-bikes	Practical e-bikes	Primary focus not on e-bikes
Yamaha Motor	Japan	U.S, Europe, Asia pacific	Big	2400-3500\$	250W-500W	Variety of models	Strong brand	Focused more in the parts
Alta Motors	USA	USA	Small	10,000-16,000 \$	350W	Off road e-bikes	Compact high-performance e-bikes	Market focus mainly on U. S

FIGURE 18. Competitor analysis (EBR 2018), (Spinningmagnets June 20, 2013), (eZeebike.com 2018), (L. Kolodny 2016) (Alta Motors 2018) (D. Phelan 2017)

The figure above shows the different companies that operate and produce e-bikes and that could be competition. The table shows the countries, market area, style, size, price and cost, power range, pros and cons of the current companies have.

The price range in NTD in average for the different companies are from **15,000NTD** to **470,000NTD** being the most expensive and having the best technology with best features. Some of the companies are indirect competitors and are seen as threat since they already possess the technology required for e-bikes. The cheapest e-bikes have the poorest features, however in Taiwanese market customers are more interested in the price rather than the complicated features. This is the main market strategy for the e-bikes in this region. To sell the most practical and cheap e-bikes possible.

Bolt e-bikes

Bolt is an e-bike provider from San Francisco. The bikes are produced in a small garage with the same type of lithium-ion batteries used in Teslas. This makes the company still small, but the technology is advanced. It will not take long when the company begins to grow rapidly as the demand increases. (S. Buhr 2015)

The Bolt bikes are clean and easy to ride per the Co-founder Nathan Jauvtis. The company is new and there were already first orders for these \$5,000 vehicles. Few key tech innovations that set this bike apart from the rest. (S. Buhr 2015) The price is competitive and once the emission free industry grows, so does the demand for e-bikes.

Zero Motorcycles

- Zero Motorcycles is an American manufacturer that focuses on modern electric bikes that accelerate faster, travel farther and can be recharged more quickly than most of the e-bikes in the market. (C. Fleming October 18th, 2017) These e-bikes are more for free time use and could not be an effective solution in Taiwan for normal use.

“Going faster and farther — with shorter charge times” (C. Fleming October 18th, 2017)

- Z-Force electric power packs are lighter and denser. The ZF7.2 battery has 11% more torque and the ZF13.0 battery has up to 30% more.
- For longer distances the ZF7.2 and ZF14.4 power packs allow up to 223 miles of all-electric riding between charges. These are just a few examples of the wide range of e-bikes they offer. (C. Fleming October 18th, 2017)

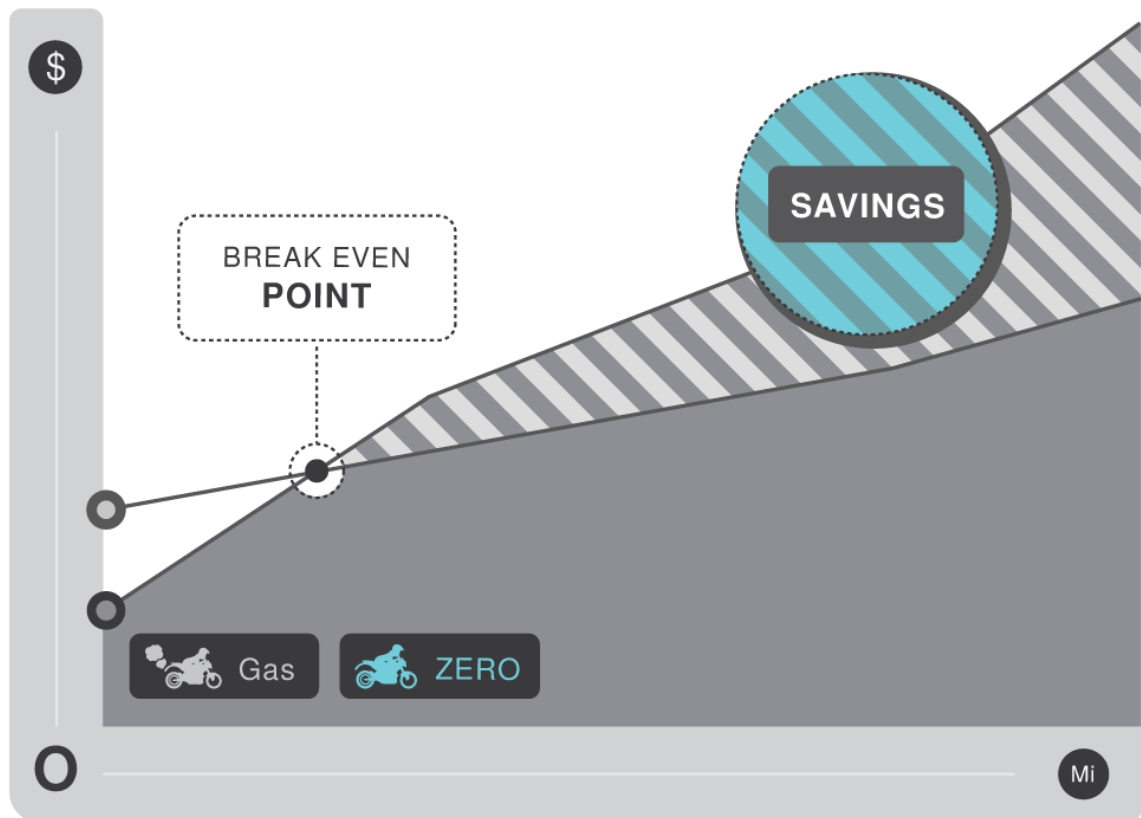


FIGURE 19. E-bike savings (Zero motorcycles 2018)

Figure above shows the benefits when driving an e-bike in the long term. Each mile ridden on a Zero motorcycle is considerably less expensive, due to the elimination of gas expenses. As it turns out, when compared to other premium brands, a Zero starts saving the owner money on gas and maintenance from day one. (Zero motorcycles 2018) It is not only economical for the owner, but it is also environmentally friendly and is a future product. After 10 years, the savings are already substantial.

The only problem with these eco-friendly and advanced bikes are that the price range is from **250,000NTD** to **590,000NTD**, which makes them relatively expensive and the target market is more for the riders that enjoy more speed and power.

4.4. E-bike supply

The figure below shows the top suppliers of e-bikes in the years 2015-2016. Taiwan is rated as the third and mainland China is the first. However, these e-bikes are mostly in different structure and are relatively simple in comparison to those offered in United States. However, the aim is to provide e-bikes with the lowest costs to the public rather than empower them with luxurious qualities.

Position 2016	Country	Import 2016	Import 2015 (position 2015)	2016 vs 2015
1	China	932.043	547.373 (1)	+ 70,27%
2	Vietnam	91.468	74.259 (2)	+ 23,17%
3	Taiwan	79.316	43.095 (3)	+ 84,05%
4	Hong Kong	36.932	37.854 (4)	- 2,43%
5	Switzerland	30.265	14.310 (5)	+ 111,49%
6	United Arab Emirates	9.396	2.899 (7)	+ 224,11%
7	United States	4.194	835 (8)	+ 402,27%
8	Japan	1.825	4.217 (6)	- 56,72%
9	Canada	710	91 (14)	+ 680,21%
10	Indonesia	600	286 (9)	+ 109,79%

FIGURE 20. Top-10 Suppliers, 2016 & 2015 (in units). (Eurostat 2016)

The market for e-bikes seems to be the biggest in the East-Asia region, Taiwan being the third biggest supplier of electric vehicles. This shows the opportunity for e-bikes to be tremendous.

In 2013, 410.000 electric bicycles sold in Germany from which 130.000 were imported and 278.000 were produced in Germany. 58% of the e-bike imports are from other EU member states and 41% comes from Asia. 87% of Germany's e-bikes were exported to other EU countries. In Austria e-bikes had a market share of 11.3%. In Switzerland one in every seven bikes sold in an e-bike. This indicates that the market for the pedal e-bikes are quiet high in the mid European countries, however do not serve that much purpose in the Nordic ones. In France 56.000 e-bikes were sold in 2013. In the United States, an estimated 185,000 e-bikes were sold in 2013, according to the Electric Bikes Worldwide Report (EWBR), a trade publication. (INSG Insight, September 2014, 3-6)

These reports indicate a market possibility in the European countries that do not have a hard and long winter. Germany is a big supplier of e-bikes, but these versions are more related to having a pedal and focused on the healthy aspects which are not the highest priority in most of the Asian countries.

Annual sales of e-bikes in the world's largest market, China, are expected to decline. China is facing market saturation and new bans on e-bike use in large areas of major cities. China still leads the global e-bike market, however other countries are on pace to increase their market share. (Navigant research 2016)

4.5. Costs

The average cost of an e-bike differs a lot since it depends on the quality of the e-bike, the style, the components and the country it is sold in. The overall price range of the e-bikes varies from **20,000NTD** to **260,000NTD**. This is a wide range however, the e-bikes produced in Taiwan do not have to reach the highest prices since price will be one of the competition factors. There is a list of different style e-bikes with their prices ranges. (Appendix 1.)

Electricity cost/fuel costs:

The average cost per Kilowatt hour/ changes per country, In Taiwan it seems to be with Gogoro Inc. batteries 1.3kWhx 2 (2.6kWh), since there are two batteries, and this will take the rider as far as 100km with an average speed of 60-80km/h. Gogoro uses Panasonic 18650 batteries. (Gogoro Inc. 2018)

For a normal use and if the driver would go average 40km/h five times in a week with couple additional rides, the cost would be around 400NTD per month. This varies between different scooter and sometimes it can be closer to 500NTD:

The cost of battery replacement ranges from **14,500NTD** to **23,130NTD** depending on the size of the pack and whether it's custom or more standardized in shape and interface. (EBR 2018)

- Charging cost: **400-500NTD** per month
- Tune up: **2,170 – 2,900NTD+**
- Flat tire fix: **290 – 580NTD**
- Brake adjustment: **580 – 1,015NTD**
- Drivetrain replacement or adjusting: **580 – 1,740NTD** (EBR 2018)

E-Bike cost

Initial Cost

- More expensive than a normal bicycle. The cost of the motor, battery, design and electrical equipment and other specifications.
- There will be overall reduction on running costs.
- Type of Electric Bike (Style; mountain, off-road, normal)
- E-bikes batteries can range from 25km to 160km (Gogoro 100km), on battery capacity and how efficiently the e-Bike applies the power. Therefore, the cost of using it can be small. (M. Brown October 23, 2013)

Replacement;

Some batteries need replacing more often than others. The range can be from 18 months to 10 years, depending on many variables. Longer lasting batteries cost a little more initially, however using an e-bike could lower the overall running costs. For example, you plan to use the bike for the next 15 years:

Comparison:

Basic Battery	Advanced Battery
Battery Cost: 8,180NTD	Battery Cost: 16,350NTD
Lifespan: 3 years	Lifespan: 7.5yrs
No. of times replaced in 15yrs: 5	No. of times replaced in 15yrs: 2
Total cost for 15yrs: 44,500NTD	Total Cost for 15yrs: 32,700NTD

(M. Brown October 23, 2013)

The advanced batteries are cheaper and require less work in the end. Depending on the e-bike, usually the mountain e-bikes required more maintenance since they are used in more harsh conditions.

Electric bike running costs should be compared to those of a car. Many people are find it more economical to travel with an e-bike. Overall, there are no charges per year for an e-bike in these categories.

Categories:	Average size Gas Car	Average Electric Bike
Road Tax	175	0
Insurance	806	0
MOT	55	0
Total	1036	0

Even though these numbers are in USA, the message is clear that e-bike will save he customer a lot of money in these sectors alone. (M. Brown October 23, 2013)

These numbers indicate, that it is not only an environmental investment but also and economical. Over a long period of time the economic savings of an e-bike is the best investment for an alternative mode of transportation.

Production costs

The data below is quite old, however serves as an indication in what direction the e-bike market is going.

The EWBR highlights that there was an 80 percent sales growth in 2013 over 2012. The typical prices for an e-bike in USA range from about \$1,000 to \$3,500. Sophisticated models cost around \$5,000 to \$10,000. The popular ones are in the \$1,000 to \$1,500 range. It is estimated that the total market value is in the range of \$185 million to \$277 million. Different battery types are sold in many markets, but e-bikes normally using lithium batteries seem to be growing rapidly. Japan has annual sales of about 300,000 for several years. The market in Korea, Taiwan and other East Asian countries appears to be growing as well. (INSG Insight, September 2014, 3-6)

These predictions support the demand and supply of e-bikes. The market is growing and since people are growing more socially, environmentally and economically aware of the

global changes, it can serve as a boosting factor for the success of e-bikes in Taiwanese market. (National Statistics, Republic of China (Taiwan) 2018.) These statistics show the amount of pollution that currently are generated from the petrol vehicles in Taiwan.

4.6. Technology

Batteries that have been proven to be sustainable and energy efficient are the ones that are going to get the most investments in the future, since CleanTech will be a huge market especially in Taiwan. (Business Sweden 2015, 7-10) The importance of CleanTech is immanent, however is it done fast enough and will a brand-new battery technology take over and make it even more sustainable to use them. These speculations are hard to answer and it is more important to focus on the ones that already exist in the market.

Advantages of having an advanced main battery powering the e-bike:

- No need to change batteries
- No separate charger required
- Lights will always work, when there is enough battery left
- In the long run, it is going to be cheaper
- Higher quality and brighter lights increase customer satisfaction (Micah 2016)

The next chapter will focus on the different price ranges of the e-bikes are go in debt with the various components that e-bikes have. This will give the reader an understanding how much the different parts cost and what are the price ranges that different type of e-bikes has. The price ranges vary because of the quality, type, taxation, laws and the cost of the resources to produce them. Even though Taiwan is right next to mainland China, it might be easier and cheaper to produce the e-bikes inside Taiwan. (See Appendix 13. for Wholesaler Price Indices (WPI) changes in March 2018.) (National Statistics, Republic of China (Taiwan) 2018.)

E-bike parts

Raw materials used in the manufacture of a motorcycle body, are metal, rubber and plastic. The motorcycle frames consist of metal and so are the wheels. The frame may be protected with plastic parts. The seats consist of synthetic substance, such as polyurethane. The transmission system contains of a clutch that has a steel ball with metal plates. The electrical system has battery, wires and coils, spark plugs and lights.

(MOTORBIKELinks 2015) (See Appendix 13. for Wholesaler Price Indices (WPI) changes in March 2018.)

E-bike frames

The frame is the most important part of the e-bike. It is linked to the other parts, since if it is too heavy the other parts must be changed and vice versa if it is too lightweight, the other parts should be light as well. There is a list of the different e-bike frames that are available now and what are the ones that might be the best for this business model. (See Appendix 2.)

Controller

Controller is the brain of the e-bikes. It connects to all the other electronic parts such as the motor, battery and the throttle. The inputs from all the other components are taken in by it and it determines what should be signalled to them in return. List of controllers (Appendix 3.) (Electric bicycle guide 2013)

Throttle

The price range is from **230 NTD** to **580NTD**. (Grin technologies 2018) An effective throttle can increase or decrease the power of an engine. Usually it is used to decrease it, since for safety purposes it is important that the speed can be regulated if parents want to be sure that their children are not using the e-bike to go too fast. This makes the e-bike more attractive since for different kind of riders the speed can be adjusted per their needs. Thumb throttle, half twist throttle and full twist throttle are considered the best choices for modern e-bikes. (E-bikeschool.com 2018)

Motor

Motor is the centre and the power supply of an e-bike. Nowadays the technology enables the motors to be smaller, more efficient, more powerful and durable than ever before. The trend has been long that things are made smaller and better. The motors should be cheap in price and have relatively large output and power. You can see the list of different motors in the (Appendix 4.)

Charger

Charger is one of the most vital parts of the e-bike. The chargers nowadays are highly advanced and secure a fast and safe way to transit electricity to the e-bike wherever and

whenever. The charger must be suitable for the battery, otherwise it will break it on time and lower the durability and the power level of the battery. (See Appendix 7 for different charger options).

Battery

The battery is said to be the most important factor when comparing high-quality e-bike with a low-quality one. It is often the most expensive part on an electric bike. The battery is the reason that electric bikes having promising options for future business models. The efficient, lightweight, rechargeable batteries in use are the reason for e-bikes to provide users with energy-efficient, long-range, reliable transportation. (LoneStar eBikes 2018)

Lithium batteries are used to create more, lighter and more reliable electric bikes. The important factor of an electric bike battery, is its range. Nowadays electric bike batteries are efficient enough to provide rider the power and capacity needed to make their bike rides convenient, fun and productive. Lithium batteries longer life span increases price of a lithium battery. (LoneStar eBikes 2018)

4.7. What will appeal to the customer?

According to a Harvard Business Review, many customers concentrate on the price. The review wrote about a value pyramid that was meant to divide the needs and values of everyday decision in customers. The value pyramid has four main layers that are functional, emotional, life changing and social. The functional parts have for e.g. quality, variety, simple, less cost, less time consumption and many more, whereas as the highest part of the pyramid consist of social indicators such as self-transcendence. The idea of the study is to show in what way the values are generated and in which order they usually tend to be experienced. Companies that can deliver multiple elements of values tend to have a stronger customer satisfaction and loyalty. These four core values are the fundamental needs of everyday decisions for products and services. (E. Almquist August 11, 2016) This theory can be used to forecast what are the best values to be used in the e-bike business.

The costs of the petrol, maintenance and MOT affect the choice of e-bike vs a regular motorcycle. (See Appendix 12 for Consumer Price Indices (CPI) changes in transportation sector in March 2018.) It all begins with a specific calculation where the customers weight its options and concludes whether the e-bike would be a better solution.

In the long run, it will always be. (See FIGURE 15. E-bike savings (Zero motorcycles 2018))

These are the four main reasons why the e-bike will be a success and appeal relatively attractive to the Taiwanese population:

Number one: In the recent years, the price of oil has been going down and up, however in comparison to the global averages it has gone more expensive and will go in the future as well. Electricity is more available and does not run out like oil in the future. The field of CleanTech will be one of the biggest in the future, so it will get more popularity and be one of the main sources when thinking environmentally friendly. (Business Sweden 2015, 7-10)

Number two: The so called Asian values vs. the European ones are relatively new for many western companies, since there are different regulations and rules that they follow. Even though western countries see the climate change as primary issue to tackle, it is not the main reason for Taiwanese people to choose an e-bike over a regular motorcycle. They find the practicality and price factors more important. (Bicycling in Asia 2008, 27-33) Even though mainland China has been tackling climate change with big projects, the focus of the e-bike marketing will be first in the customer's point of view while at the same time decreasing the carbon footprint.

Number three: The manufacturer must understand an opportunity here, since the e-bikes will be the future of all big cities and most of the rural areas once they build vast electric lines and charging stops. The urbanisation is growing all around the world and big cities are facing huge problems with over population of cars and other modes of transportation. Emission free and practical e-bikes are the best solution that will not only make the cityscape better but also give people to live in an emission and noise free environment.

Number four: The final and the most important factor of the e-bikes are its ability to provide a fast and easy driving experience. End of the day it comes to the practical sides of the e-bike that matter the most. (Bicycling in Asia 2008, 27-33) The Taiwanese people are not so keen on having expensive and luxurious e-bikes but rather having ones that are reliable, safe and easy to use.

Below are listed the perks of an e-bike once more:

- Lightweight
- Effortless driving experience
- Battery capacity
- Design

No need to do these things with an e-bike anymore:

- Buy gas
- Replace clutch
- Change engine oil or oil filter
- Synch throttle and idle speed
- Lubricate or adjust clutch cables

(Zero motorcycles 2018)

In summary, the figure below shows what are the four main reasons for the success of the e-bikes in the Taiwanese market.

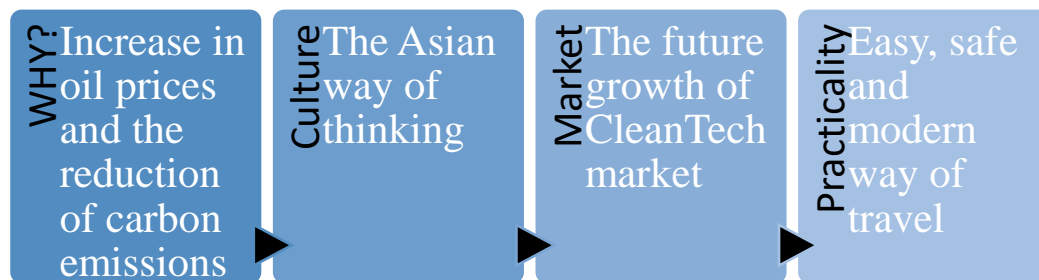


FIGURE 21. The reason for the success of e-bikes.

The purpose of the figure is to summarise the main direction of the content of the thesis and what the reader should understand from it. It shows that the average increase in the oil prices and the reduction of the carbon emissions trend pushes the CleanTech business forward. This trend is not going to disappear and will provide as the base for the future of CleanTech. (Navigant research 2016)

The information received from my commissioner states that Asian people are mostly not that keen on thinking about what is environmentally friendly and what is. They focus on more of the practicality and the price. (Bicycling in Asia 2008, 27-33) This forces the business model to be not only environmental solution but rather an economical one.

However, the electricity used in the e-bikes provides the consumer and the manufacturer a green transportation solution.

The CleanTech sector is going to increase in Taiwan, because of the investments the sector receives. (MOTC 2018), (Wang April 20, 2011) This will enable future business to thrive in Taiwan and possibly get subsidies from the government. As stated in the 3.5.3 chapter, the growth of the electric bike and bicycle segment, is to be expected to grow at a CAGR of 3.3%. (Market insider 2018) These numbers could increase even more if the CleanTech sector will receive more government support in Taiwan.

Finally, as stated before, Taiwanese people search the easy, modern and safe way of travel. (Bicycling in Asia 2008, 27-33) This information supports the fact that the primary focus on e-bikes should be on the practicality and price. Since e-bikes use electricity as their source of power, the environmental aspect is self-expletory. Of course, the electricity must be produced in some ways, however it is still the right step to the right direction.

5 RESULTS AND CONCLUSIONS

In this chapter the results will be analysed and a conclusion will be established on the basis whether there is or is not a possibility for e-bikes. Also, the possibility for e-bikes to own the market and how to pursue it, will be analysed. If a market opportunity exists for e-bikes, what should be considered before entering the market, what would be the realistic time frame and capital required for having a secure approach to the current market. If market opportunity does not exist, what is the best outcome to get from this thesis and what adequate information they can utilize for their purpose?

5.1. Opportunities and conclusion

The aim is to produce an e-bike with a battery providing high performance, efficiency and sustainability. The e-bike price range for a practical and an attractive frame style should be around 30,000-60,000NTD. The costs could decrease when using a local production. Normal aluminium bikes range is from 2300-5900NTD. (Walmart 2018) The parts required for the e-bike such as battery, throttle, controller, charger is all together around 25.000-35.000NTD. (Grin technologies 2018) The total price of an e-bike is around 40.000NTD (1360\$). Gogoros price range for an e-scooter is from 38.000-45.000NTD. Therefore, e-bike should be cheaper. However, Gogoro could serve as a potential partner since they launched a new revolutionary electric battery technology. (Gogoro Inc. 2018) On the other hand; they could also be a potential threat, if they were to demand a high price on the batteries and force the competitors to duplicate the technology or leave the market. It is difficult to address whether Gogoro Inc. would be interested in entering the market with an e-bike. Gogoro Inc. is currently producing their e-scooters and aiming to increase their market potential with their new battery technology. They launched the new GoCharger Mobile technology. (Gogoro Inc. 2018) This could be a new, easy, fast and revolutionary way to charge the batteries and provide the customers a flexible and enjoyable ride experience.

The optimal e-bike price range would be around 15.000-20.000NT. This might still be considered a relatively unrealistic price ran. The products are aimed to have high-quality components. The price of an e-bike depends on many factors; is the Taiwanese market too competitive, too challenging to enter or do the legislations and laws intervene with interests of the business. The research aims to prove; how costly starting a new e-bike business would be or would an international or a domestic company take over and push

the competition away from the market. These questions are hard to answer. After the market analysis is completed, Seowon Ltd. will analyse and draw their conclusion whether it is profitable to start a new e-bike business or not.

Kim Väisänen in his book addresses the topic of every business understands that route to success is not easy and is not achieved immediately. Achieving the goal model (K. Väisänen 2018, 208) represents the difference in thinking how normal person vs a business person sees the different approaches. The successful people know that they fail many times before they succeed and whereas normal people think that it is either straight to success or failure. (K. Väisänen 2018, 208) This mind-set and consistency should be the base for the strategy of an e-bike manufacturing. An efficient strategy for the future of the e-bike market could be that Seowon Ltd. would approach a local manufacturer and offer their services. (See appendix 1. for Seowon Ltd. business model)

Is the time, right? Currently the supply and demand for electric vehicles are growing worldwide due to the increase in CO2 emissions. Taiwanese people themselves already find it harder to breath, due to the bad air quality. (Business Sweden 2015, 7-10) There is a dire need for a global scale change in the transportation sector for green values and to tackle the increasing threat of the global warming. According to the research results in the fourth chapter, the time is right for e-bikes to enter the market; however, it depends on the existing technology. Is existing battery technology efficient and sustainable enough or should the companies wait for a new technology to emerge. It is well known that entering the business and manufacturing e-bikes enables battery technology to improve. The increased demand of efficient and sustainable battery technology, will pave the way for a better capacity and performance in the batteries.

Is the place, right? The transportation industry in the Taiwanese market is full of local manufacturers. The competition sector (See chapter 4.3) shows that there are already a vast number of competitors around the world and it would be rather challenging to target USA and Germany market's for exporting electric vehicles. This is because USA and Germany both have a market supply of high quality electric vehicles. (See Figure 18.) First it would be important to conquer the Taiwanese market and offer products and services that are rather cheap and high-quality. Then afterwards expand to other markets, such as the European market.

Taiwanese market consists of many local manufactures as listed in chapter 4.2. Many of these manufacturers focus on ATVs, motorcycles or scooters. If the market is suitable, these companies have the potential to start investing in e-bikes. The companies that already operate in the Taiwanese market, possess capital and understanding of the market, which makes it hard for new companies to enter the market. Therefore, the best way would be to target the already existing companies that have capital and information needed for entering a new market. According to the second chapter, Taiwan has a suitable market to start a business. Big companies entering the market with their political power and networking influence, could pose a huge threat.

The future of the e-bikes

The aim of the research was to find out whether there is a possibility for e-bikes in the Taiwanese market or not. The results indicated that Taiwan is a perfect market for e-bikes, since there are already similar products on the market, such as e-scooters. Chapter four lists the companies that operate in the Taiwanese market and the possible threats that companies might face. Many companies around the world produce e-vehicles because they know the need for environmentally friendly products.

As stated in the second chapter, the CleanTech sector is going to grow in the future and provide more demand and supply for environmental products. Taiwan is focusing on areas such as renewable energy, energy saving and green industry. When the government of Taiwan introduced the renewable energy bill and set the new renewable energy targets, the parliament begun to pass bills, which were responsible for the installation of around 10,000 megawatts of renewable energy capacity in Taiwan. The bill is expected to provide more than \$900 million in renewable energy investment to the country. This bill tries to reduce carbon dioxide levels to its 2008 levels. This will increase the jobs in the clean energy sector and might also increase the subsidies for emission free modes of transportation. If there will be an effective infrastructure for the Taiwanese e-vehicle market, the usage of e-vehicles will grow. Taiwan is heading towards being a modern, efficient and eco-friendly country. (Wang April 20, 2011)

6 DISCUSSION

This thesis was specified for Seowon Ltd. to research whether CleanTech companies operating in transportation industry should target the Taiwanese e-bike market or not. With the support of the commissioner from Seowon Ltd. and TAMK, the e-bike market was targeted in the aim of researching a potential market entry strategy for a potential company. The thesis will be narrowed down to the key elements of the analysis and the non-theoretical version will be used in Seowon's marketing research department. The relevant numbers, competitor information and statistics are the base of the research that is forwarded to Seowon Ltd. The theoretical version will be presented to TAMK and the commissioner Mr. Vilén will grade it according to the TAMK standards.

With the support of Mr. Harjunpää and the data given by Seowon Ltd. about the Taiwanese market opportunities and the existing possibilities for a market entry in the CleanTech area, gave an understanding whether a market entry was reasonable and profitable or not. In conclusion, the chapters 3 and 4 shows that there is a possible market for e-bikes, however more specific research should be conducted to provide the company a more secure base for a market entry. More detailed information about the e-bike market required but was unattainable due to lack of resources.

The data obtained mainly via online sources, academic literature and the given topics by the commissioner gave a broad understanding of the electric transportation sector in the Taiwanese market. Currently no company is only focusing on e-bikes or having them as their primary business. This would enable Seowon Ltd. to address a certain company and give them an opportunity for the e-bike market. Once all the required information is gathered and the numbers and facts are validated Seowon Ltd. is ready to approach a company or a startup and support them with the required information required to enter the Taiwanese electric transportation market.

The objective of the thesis is to provide a research paper for Seowon Ltd. to first approach a company operating in the Taiwanese transportation sector, second provide them enough background information about the e-bike market and third how to enter the e-bike business. The thesis will be condensed into a 20-30 paged marketing report, that Seowon Ltd. will use in their research department.

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7 APPENDICES

Appendix 1. Seowon Ltd.



SEOWON

Seowon is a **sales and strategy consultancy** focused on enabling software startups establish and grow their business in Asia. We will validate the market and generate revenue without a significant investment.

Seowon Sales Program gives our clients a local presence immediately. We use your business cards and email addresses, introducing ourselves to customers as your team. You own all the leads, contacts and opportunities, and have full transparency into what we do.

The software startup problem

Many software startups look to Asia to secure additional revenue, but are not equipped to enter the market. We can solve those issues, and secure revenue:

Problem	Solution
Missed opportunities in Asia <ul style="list-style-type: none"> • No local representation • Limited sales resources 	Seowon Sales Program <ul style="list-style-type: none"> • Immediate local presence • Access to an experienced sales team
Limited funds between seed and C-round <ul style="list-style-type: none"> • Limited sales budget • Pressure to secure revenues 	Seowon pricing is tailored for early stage startups <ul style="list-style-type: none"> • Low retainer • High commission
Financial risks associated with international expansion <ul style="list-style-type: none"> • Setting up a local entity • Dealing with local regulations, hiring, taxes 	Low-risk, minimal investment <ul style="list-style-type: none"> • No need for a local entity • Invoiced as service
Hiring difficulties <ul style="list-style-type: none"> • High cost • Cultural issues 	No hiring involved <ul style="list-style-type: none"> • Lower cost than hiring directly • Experience with both Asian and Western businesses

Some of our past clients:










Our process

Our process begins from product specific training and receiving the email addresses, business cards and sales collateral, after which we set out to sell:

Validating the market

- Identify targets
- Meet stakeholders and decision makers
- Build pipeline

Driving sales

- Complete POC's
- Negotiate terms
- Close deals

Expanding

- Establish local entity
- Hire a local team
- Hand over accounts

➔

What about the cost?

Usually our commission rate is 10-15%. On average our monthly retainer is around US\$ 7,500 – less than the cost of a local sales director.

Typically our entire monthly expenses are less than one round trip between North America and Asia – approximately US\$ 700.

Appendix 2. Safety measures for the e-bike users

1. The dead stop

When applying too much throttle, there is a chance for a severe accident to occur, even though usually these do not result in serious bike accidents if the speed is not high. (E. Hicks. July 26, 2012.)

2. Twisting throttle while bike is on/off

An electric bike is silent; therefore, it might be hard to notice whether it is on/off. If the throttle is twisted at the wrong time it can result in malfunctions. If the throttle is twisted, the e-bike might take off. The initial reaction is to grip the throttle tighter, which can result into a worse incident.

Manual for being safe:

- Consider a thumb throttle.
- Consider a half grip throttle.
- Buy an e-bike where the power does not come on until reaching 5mph.
- Buy an e-bike, which senses how hard you press on pedals and activates the throttle accordingly. (E. Hicks. July 26, 2012.)

3. Front hub motor fork failure (Middle part of the front wheel)

This is one of the most dangerous e-bike failures, since breaking your front fork might end up in a head first over the handle bars which can result in a severe face plant. Every front wheel hub e-bikes should use torque arms and be carefully installed.

Manual for being safe:

- Install quality torque arms.
- Do not use front wheel drive with suspension forks.
- Have your front wheel drive hub motor professionally and carefully installed.
- Do not use a high-power motor in the front wheel.

4. Lithium batteries

Fire explosions of the electric bike batteries, are more common than one might think. Most of these accidents are related to home-made e-bikes and wrong instalments. Lithium batteries are very combustible and should be treated with caution.

Manual for being safe:

- Use a battery management system that protects and manages the rechargeable batteries.
- Do not build your own battery pack without expertise.
- Do not allow batteries to be damaged in any way and use a protecting layer on top of the battery.
- Caution when you change/charge your batteries. (E. Hicks. July 26, 2012.)

5. Silent at high speed

Many e-bikes tend to be completely silent. In China, they are “Silent Killers” (E. Hicks. July 26, 2012.), since people are unable to hear them while crossing the street. A normal bicycle would cause some bruises but an e-bike going around 50km/h can cause death. In a time when the awareness grows and people are more able to notice the e-bikes, it will become much safer.

6. Traffic rules

Since the e-bikes might follow the same rules as a normal bicycle there might be future regulations that may change this. All the while the e-bikers must respect the law and treat themselves more as a motorcycle than a bicycle even though getting some of the perks of e.g. parking the e-bike wherever they would like to. The same rules apply when passing a red light, if caught it can be treated as same as jaywalking or even worse depending on the legal system for e-bikes. If the battery, motor or controller dies and leaves you without power unexpectedly, the results can be severe. This means that regular maintenance is vital for bikes safety. (E. Hicks. July 26, 2012.)

Appendix 3. The different type of e-bikes with their price ranges

2016 Cruisers e-bikes: Average cost of about **88,000NTD**, ranging from roughly **43,000NTD** to **230,000NTD**.

2016 Mountain e-bikes: Average cost of about **120,460NTD**, ranging from roughly **35,000NTD** to **260,000NTD**.

2016 Road e-bikes: Average cost of about **132,000NTD**, ranging from roughly **55,000NTD** to **232,000NTD**.

2016 City e-bikes: Average cost of about **81,000NTD**, ranging from roughly **35,000NTD** to **232,000NTD**.

2016 Folding e-bikes: Average cost of about **51,000NTD**, ranging from roughly **20,000NTD** to **145,000NTD**.

2016 Cargo e-bikes: Average cost of about **95,000NTD**, ranging from roughly **50,000NTD** to **175,000NTD**. (EBR 2018)

Appendix 4. Different e-bike frames

- Different types of frames ranging from **1,500NTD-7,500NTD** (Only frame) (eBay 2018)
- Aluminium mid drive motor electric bike frame **4,700NTD** (Only frame) (Alibaba 2018)
- EEB Full Suspension E-Bike Frame **10,000NTD** (Only main frame structure) (EM3ev 2016)
- Electric endure e-bike frame. **15,000NTD** (Luna cycle 2018)
- HopMod Frame **53,000NTD** (Including already a motor, a custom seat and a battery pack) (HopMod 2018)
- Hyena Frames Alpha **35,000NTD** (Frame only)
- Hyena Frames Alpha **55,000NTD** (With a suspension) (Hyena electric bikes 12.10.2014)

Appendix 5. Different controllers



Images. 1-4. E-bike controllers (Grin technologies 2018)

1. 36-48V, 20A Sinewave Controller with ON/OFF Switch and 90cm Motor Phase Cable using Waterproof Z910 Higo Connector, **2,900NTD**

2. 36-48V, 25A Sinewave Controller with ON/OFF switch, Proportional Regen, and CA3 Connector. For both Censored and Censor less, Brushless Motors. **3,650NTD**

3. High-Power ASI BAC Cadmium 2000, Field Oriented Motor Controller. 90V Max, 150A Peak Phase Current (50-75A Continuous). Requires Advanced Tech Savvy Users to Configure. **11,000NTD**

4. Grin Phaserunner, - Clear. Compact Field-Oriented Waterproof Motor Controller. 90V Max and 96 A Peak Phase Currents, ~40A Continuous. **8,600NTD**
(Grin technologies 2018)

Appendix 6. Different motors



Images. 1-4 Motors (Grin technologies 2018)

1. eZee V2 (350RPM) Rear Hub Motor in 20" Rim with Tube and 1.75" Tire **16,000NTD**
2. eZee V2 (250RPM) Front Hub Motor in 26" Rim with Tube and 1.75" Tire **16,000NTD**
3. Grin All-Axle Hub Motor Pilot Release. Fast 5 turn (~12.5 rpm/V) Winding **17,500NTD**
4. 9C+ REAR 2705 Disk Compatible Motor with 0.35mm Laminations and Thermistor. 12.5 rpm/V for 20" Wheels. (Grin technologies 2018) **5,500NTD**

Motors seem to have the price range from 5200NTD to 17,500NTD depending on the performance. These are just rough prices; the costs are reduced once there will be the mass production of the e-bikes.

Appendix 7. Different chargers



Images.1-4. Chargers (Grin technologies 2018)

1.Cycle Satiator Universal Programmable Battery Charger, 48V 8A model, plus Optional Programming and Adapter Cable. 8,600NTD

2.48V 2.5A Generic Lithium Charger from Allcell (13s, 54.6V output) 870NTD

3.Cycle Satiator Universal Programmable Battery Charger, 72V 5A model, plus Optional Programming and Adapter Cable. 8,700NTD

**4.36V 4A LiFePO4 Charger, Aluminium Casing, Fan Cooled. (43.5V output)
(Grin technologies 2018) 2,900NTD**

Appendix 8. Different Batteries



Images.1-4 E-bike batteries (Grin technologies 2018)

1. 24V 23Ah Lithium Battery with Panasonic PF Cells, Rectangular Plastic Enclosure and 50A Continuous BMS. UN38.3 **12,500NTD**
2. 36V 19Ah Vertical Battery Replacement for eZee Bicycles UN38.3 **20,300NTD**
3. 36V 23.5Ah Downtube Battery with Panasonic GA Cells, 40A BMS, no charger. UN38.3 **22,000-30,000 NTD**
4. 52V 13 Ah Downtube Battery with Panasonic GA Cells, 25A Rated, and 2A Charger. UN38.3 **17,000NTD** (Grin technologies 2018)
5. (No image) Gogoro uses Panasonic 18650 batteries. These are most likely the ones that are being used. (Gogoro Inc. 2018)

Appendix 9. Cloud-based CRM

- Automatic software updates
- Cost-effective
- Scales with other softwares
- The ability to have the workplace from anywhere
- Efficient collaboration
- Centralized customer database
- Comprehensive overview of the customers,
- Instant access to real-time insights and data
- Automated task management for: closing of the sales deals on time and enhanced service deliverance with excellent lead times.
- Customer satisfaction, relationship and increased retention rates.
- Easy to use and easy to access
- Cost friendly service
- Multiple device support system
- Secure high data protection
- Customization opportunities, personalize it for the user
- Faster deployment
- No hardware to purchase or software to maintain (Z. Plaksij 2018) (SuperOffice AS 2015)

Appendix 10. Traffic and vehicles of Taipei from 2013-2017

Traffic & Vehicles of Taipei City Periphery

Year	Grand Total (PCU/hr)	Vehicles(%)			Destination Area								
		Large Car	Small Car	Motorcycle	Tamsui	Shenkeng	Sanchong	Banqiao	Yonghe, Zhonghe	Xindian	Xizhi		
2013	Peak AM	In	86,973	1.1	30.0	69.0	4,663	464	25,240	12,758	23,425	16,646	3,777
		Out	40,361	2.3	49.0	48.7	4,088	158	12,325	6,957	6,509	8,038	2,286
	Peak PM	In	47,579	1.9	45.0	53.1	3,729	379	13,934	5,477	7,086	14,854	2,120
		Out	63,742	1.3	34.9	63.8	4,206	170	20,659	11,284	15,415	8,883	3,125
2014	Peak AM	In	89,325	1.0	30.1	69.0	4,644	500	25,943	12,882	24,005	17,548	3,803
		Out	39,601	2.2	48.8	49.0	4,067	217	11,862	6,809	6,406	7,950	2,290
	Peak PM	In	48,024	1.8	45.4	52.7	3,728	300	13,935	5,255	7,222	15,488	2,096
		Out	65,330	1.2	34.2	64.6	4,327	181	22,009	11,196	15,457	9,039	3,121
2015	Peak AM	In	84,147	0.9	29.8	69.2	4,598	471	24,560	11,236	23,066	16,476	3,740
		Out	38,508	2.0	48.0	50.0	3,969	231	11,729	5,914	5,975	8,331	2,359
	Peak PM	In	45,310	1.8	44.5	53.7	3,739	319	13,299	4,599	7,076	14,123	2,155
		Out	60,377	1.3	34.7	64.1	4,271	196	21,106	10,011	13,648	8,105	3,040
2016	Peak AM	In	66,164	1.3	34.6	64.1	3,475	217	25,790	6,257	14,481	12,384	3,560
		Out	38,082	2.1	47.0	50.9	739	163	10,039	5,102	11,889	7,780	2,370
	Peak PM	In	39,505	1.7	48.0	50.3	2,428	150	14,697	3,422	7,566	9,059	2,183
		Out	48,223	1.7	41.7	56.7	971	163	17,794	5,952	12,827	7,092	3,424
2017	Peak AM	In	84,714	1.1	32.7	66.2	5,313	186	25,443	13,612	21,492	14,533	4,135
		Out	37,575	2.0	50.0	48.0	3,474	179	11,012	5,561	6,920	8,044	2,385
	Peak PM	In	44,682	2.0	45.7	52.3	3,844	120	12,981	5,756	7,102	12,666	2,213
		Out	60,975	1.2	34.6	64.2	3,803	177	20,736	10,018	14,873	7,798	3,570

Source : Traffic Engineering Office, Taipei City Government .

(Department of transportation, Taipei city government 2018)

Appendix 11. Two-stroke and four-stroke motorcycle emission

Table 1.2.1.3 Pollution emissions—by Line Source, 2016

Unit: thousand M.T.

	Total	TSP	SOx	NOx	NMHC	CO	Pb
Total	698	26	0	154	114	403	0
Gasoline passenger sedans	213	9	0	21	34	150	0
Gasoline small trucks	51	1	0	4	6	39	0
Diesel fuel small trucks	18	3	0	8	1	7	—
Diesel fuel buses and heavy trucks	171	9	0	110	10	43	—
Two-stroke motorcycles	31	1	0	0	13	16	0
Four-stroke motorcycles	214	4	0	12	50	147	0

(National Statistics, Republic of China (Taiwan) 2018)

Appendix 12. Consumer Price Indices March 2018

The Changes of Consumer Price Indices March 2018

Groups	Weight (%)	Index of March 2018 (2016=100)	Compared with Previous Month (%)	Compared with the Same Month of Previous Year (%)	The First Three Months of 2018 Compared with the Same Period of Previous Year (%)
General Index	1 000,00	101,15	-0,98	1,57	1,54
The Basic Group					
1. Food	237,26	99,61	-0,68	1,31	1,02
Meats	23,52	103,96	-1,25	2,84	3,00
Eggs	2,78	92,34	-4,88	-5,32	-0,43
Fish & Seafood	14,31	108,42	-3,24	5,28	4,47
Vegetables	14,44	73,45	-12,53	14,59	22,51
Fruits	24,72	85,98	0,86	-23,24	-26,56
2. Clothing	45,77	95,57	-0,89	1,79	1,83
Garments	33,03	92,67	-1,33	0,17	0,42
3. Housing	227,02	101,06	0,06	0,95	1,01
Residential Rent	146,32	101,44	0,08	0,71	0,76
Water, Electricity & Gas Supply	19,70	97,55	-0,74	1,87	2,87
4. Transportation & Communication	153,11	103,56	-0,69	1,86	1,91
Fuels & Lubricants	26,10	116,80	-0,44	6,99	6,57
Transportation Fees	28,07	103,06	-2,68	2,08	2,55
Communication Fees	28,93	98,92	0,14	0,47	0,35
5. Health	42,85	102,32	0,00	1,11	1,45
Medical Care Services	20,45	103,09	-0,08	1,83	2,21
6. Education & Entertainment	147,26	99,87	-2,02	0,30	0,22
Educational Expenses	64,76	100,84	-0,03	0,47	0,54
Entertainment Expenses	82,50	98,69	-3,58	0,17	-0,40
7. Miscellaneous	146,73	106,61	-2,52	5,89	5,57
Tobacco & Betel Nuts	15,65	136,07	0,84	29,49	30,93
Services for Nursery & Nursing Care	12,71	97,60	-24,01	1,63	-1,31
Commodity and Service Groups					
1. Commodity	484,11	100,84	-0,43	2,50	2,28
Non-durable Consumer Goods	291,82	101,85	-0,67	3,51	3,16
Non-durable Consumer Goods Excluding Food	130,53	108,12	-0,20	6,38	6,45
Semi-durable Consumer Goods	85,15	98,17	-0,34	2,09	1,98
Durable Consumer Goods	107,14	99,22	0,15	-0,91	-0,72
2. Service	515,89	101,54	-1,47	1,05	1,18
Food Away from Home	75,97	103,45	0,14	1,77	1,87
Housing Service	165,83	101,40	-0,10	0,74	0,77
Transportation & Communication Service	78,89	101,32	-1,25	1,28	1,55
Education & Entertainment Service	96,59	100,20	-2,64	0,75	0,61
Frequency of Purchase Group					
Items to buy about once a month	217,05	101,55	-0,45	1,72	1,56
Items to buy about once every three months	140,92	100,89	-0,63	4,13	3,96
Items to buy about once longer than three months	511,92	100,78	-1,56	0,76	0,78
Other Special Group					
General Index Excluding Fruits & Vegetables	960,85	102,14	-0,87	1,72	1,79
General Index Excluding Fruits, Vegetables & Energy	918,02	101,85	-0,89	1,53	1,57
General Index Excluding Imputed Rent	869,89	101,12	-1,12	1,77	1,71
Households in Different Disposable Income Groups					
Lowest 20 % Disposable Income Group	1 000,00	101,21	-0,69	1,82	1,94
Middle 60 % Disposable Income Group	1 000,00	101,26	-0,86	1,65	1,62
Highest 20 % Disposable Income Group	1 000,00	100,99	-1,24	1,33	1,23

Note: All data are subject to revision 3 months after original publication due to late reports and corrections by respondents.

(National Statistics, Republic of China (Taiwan) 2018.)

Appendix 13. Wholesale Price Indices changes March 2018

Table 2 The Changes of Wholesale Price Indices

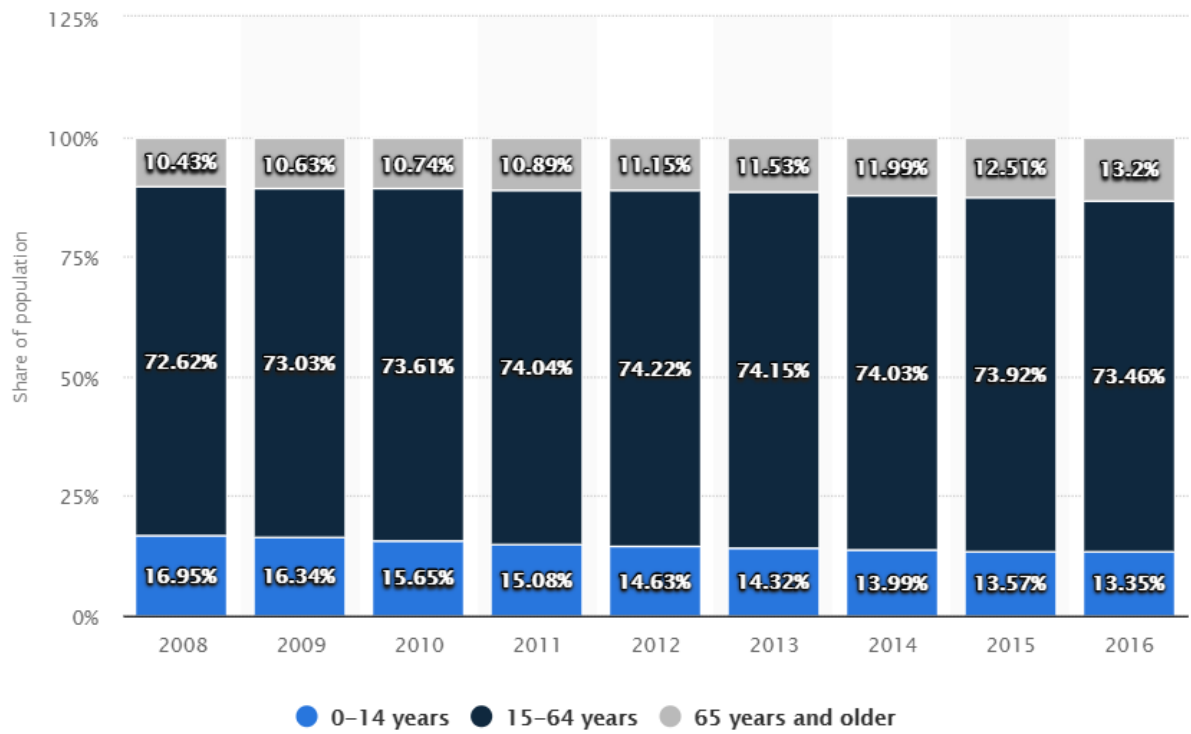
March 2018

Groups	Weight (%)	Index of March 2018 (2016=100)	Compared with Previous Month (%)	Compared with the Same Month of Previous Year (%)	The First Three Months of 2018 Compared with the Same Period of Previous Year (%)
General Index	1 000,00	101,74	-0,19	0,46	-0,17
Domestic Sales Excluding Imports	280,38	105,22	-0,37	1,70	1,85
Imports	319,20	103,62	0,05	1,95	0,78
Exports	400,42	97,52	-0,27	-1,75	-2,54
Basic Group					
1. Agriculture, Forestry, Fishing & Animal					
Husbandry Products	31,65	89,58	-3,74	-5,80	-4,43
(1) Farm Products	18,14	82,87	-3,34	-11,25	-11,08
(2) Poultry & Livestock Products	8,10	90,75	-5,94	-5,41	0,29
(3) Forest Products	0,24	105,77	-1,07	3,46	4,97
(4) Fishery Products	5,17	104,95	-2,01	7,03	6,15
2. Quarrying and Mining Products	38,62	139,38	0,80	14,71	13,06
(1) Crude Petroleum and Natural Gas	26,23	138,83	0,47	17,97	15,31
(2) Quarrying Products & Other Mining Products	12,39	142,04	1,49	10,99	10,34
3. Manufacturing Products	898,77	100,66	-0,13	-0,11	-0,80
(1) Foods	27,93	99,92	0,71	-0,65	-1,97
(2) Beverages	7,02	97,97	-0,04	-0,25	-0,79
(3) Tobaccos	3,10	120,95	-0,03	20,95	21,00
(4) Textile Products	18,51	96,57	-0,07	-2,67	-2,35
(5) Wearing Apparel & Clothing Accessories	4,64	92,20	-0,43	-3,56	-4,11
(6) Leather, Fur & Related Products	4,47	97,71	-0,05	-2,35	-2,63
(7) Wood & Bamboo Products	2,11	96,57	0,19	0,13	-1,12
(8) Pulp, Paper, Paper Products & Printed Matter	14,56	104,37	0,22	2,62	3,13
(9) Petroleum & Coal Products	44,04	125,09	-0,92	8,93	8,14
(10) Chemical Material, Other Chemical	127,31	110,32	-0,42	1,80	0,94
(11) Rubber & Plastic Products	24,49	96,99	0,28	-0,58	-1,24
(12) Non-metallic Mineral Products	16,58	94,24	0,76	-1,14	-2,29
(13) Basic Metals	57,39	118,39	0,16	5,24	5,38
(14) Fabricated Metal Products	39,99	101,63	0,50	-0,65	-1,16
(15) Electronic Parts & Components	275,17	93,61	-0,29	-2,69	-3,63
(16) Computer, Electronic & Optical Products	70,44	91,94	-0,39	-5,16	-5,41
(17) Electrical Equipment	28,87	98,46	0,02	-0,30	-1,03
(18) Machinery & Equipment	73,89	95,07	0,34	-0,33	-1,50
(19) Transport Equipment & Parts	43,66	97,01	-0,02	-0,13	-0,60
(20) Furniture & Fixtures	5,23	95,77	-0,26	-1,71	-2,04
(21) Miscellaneous Products	9,36	95,91	0,01	0,14	-1,28
4. Water, Electricity & Gas Supply	30,96	97,75	-0,30	1,27	1,74
By Stage of Processing					
1. Crude Materials	55,48	126,06	0,08	10,42	9,11
2. Intermediate Materials	376,97	103,86	-0,09	1,13	0,59
3. Finished Goods	167,13	97,93	-0,39	0,01	-0,16
(1) Capital Equipment	58,61	95,05	0,34	-0,50	-1,56
(2) Consumer Goods	108,52	99,04	-0,76	0,10	0,35
Special Groups					
Domestic Sales	599,58	104,43	-0,14	1,84	1,31
Domestic Products	680,81	100,87	-0,31	-0,24	-0,62

Note: All data are subject to revision 3 months after original publication due to late reports and corrections by respondents.

(National Statistics, Republic of China (Taiwan) 2018.)

Appendix 14. Age groups in Taiwan from 2008 to 2016.



(Statista 2018)