

A Booming Development of Electric Scooters in Taiwan

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Summary

Extending the driving range of the electric scooter relative to the driving range of the gas-powered motorcycle is an issue that could be solved in two ways. Both the battery swapping system and the automatically charging public car-sharing system are believed to be the best solutions in the near future. These two systems require establishing a common standard of interface communication protocol for the electric scooter manufacturers. Using swappable lithium-ion batteries by different makers can service either system equally well. As wider acceptance of the electric scooter grows over time, it will provide the boost needed for the burgeoning future sales of electric scooters in Taiwan.

Keywords: business model, car-sharing, lithium battery, scooter, subsidy,

1 Introduction

The Taiwanese Government's decision to reinstate and create a promotion strategy for the electric scooter can be attributed to three important reasons: (1) Fourteen million gas-powered motorcycles are running around on the island country of Taiwan, which has the highest motorcycle density in the world. Most of these motorcycles are routinely found gathering in the capital and other major cities of Taiwan causing severe air pollution in their urban areas; (2) the well-established production technology of the gas-powered motorcycle can easily be expanded for purposes of manufacturing the electric scooter; and (3) the application of the lithium-ion battery, having reached a sufficiently mature state of development, has become a key component for producing a high quality, high performance electric scooter that is capable of meeting the requirements of the consumer. In order to successfully promote the electric scooter for the purpose of fully popularizing its usage throughout the mainstream marketplace, some government-supported development strategies have assisted in achieving this, as they have already (1) established a set of safe and strict testing standards for the electric scooter (i.e., Taiwan E-Scooter Standard, TES [1]), (2) assisted the manufacturer with developing a high performance electric scooter which was able to meet the requirements of TES, (3) asked the manufacturer to strictly commit to the delivery of a minimum quantity of electric scooters annually, which correlated to the annual sales quota to put more electric scooters into public use, and mandated a complete aftermarket system, (4) made exempt the taxation of commodities and licensure for every kind of scooter in addition to subsidizing consumers and commercial enterprises when they purchased any TES-certified electric scooters, and (5) subsidized the operations company to set up the power supply stations for charging the electric scooters.

After initiating the promotional strategies mentioned above, a new high-performance electric scooter called Gogoro was commercialized into the market in July 2015 and has been in circulation ever since. Its performance is comparable to the 125cc gas-powered motorcycle, and it has a driving range of up to 110 km and can reach a maximum speed of 90 km/h. Many high-technology features were also built into this electric scooter, such as the provision for an energy supplement by way of a swapping system, keyless entry, LED dashboard, fingerprint touch to go, automatic sensing turn signals, and a synchronized braking system. Accordingly, the results of the electric scooter annual sales figures presented a significant increase from 10,000 units/year (in 2015) to 20,000 units/year (in 2016). However, this increase in sales volume is still far below the total number of unit sales of gas-powered motorcycles being sold in the marketplace today, which is 700,000 vehicles per year.

According to the results of the survey for disclosing consumer satisfaction, the electric scooter promotion team was able to glean how much current demand there is in the marketplace for electric scooters. The most highly-favored answer items selected by consumers were high performance, high quality, and a swappable battery system for the electric scooter. This and all of the information gathered by the promotion team led them to strongly recommend promoting it to prospective electric scooter consumers, who are (1) first-time scooter buyers, (2) adults who do not need to drive children to school, and (3) especially to the consumers who remain “old school” and are adamantly set against the electric scooter concept. In order to successfully create widespread usage of the electric scooter to the multitudes who do not already own an electric scooter, it is necessary to initiate the public car-sharing system for increasing greater acceptance of the electric scooter among consumers.

2 Taiwan Electric Scooter Standard (TES)

TES (as shown in Table 1) encompasses governance over 8 aspects of the vehicle, 3 aspects of the lithium-ion battery, and 2 aspects of the charging system. All of these tests aim at a high standard of vehicle performance and safety for electric scooters. Passing the safety tests will provide assurance that addresses consumer confidence in the product.

Table 1. Taiwan Electric Scooter Standard (TES)

Test Items		Methods	Criteria category (Heavy / Light / Small light)
Vehicle	Climbing ability	CNS15819-1	Over 10kph on 30% slope / 18% slope/ 12% slope
	Top speed	CNS15819-2	Over 75kph/ 45kph/ 25kph
	Acceleration	CNS15819-3	0~100 meters, shall be less than 9 sec./0~100 meters, shall be less than 12 sec./ 0~50 meters, shall be less than 9 sec.
	Driving range	CNS15819-4	Over 75km/30km/30km of driving range under specific driving pattern
	Durability	CNS15819-5	Accumulate mileage over 3,500km/ 3,500km/ 2,300km without Class A Fault during the test
	Low SOC warning	CNS15819-6	Remaining mileage not less than 2km or the declared value after warning of low state of charge.
	EMC	CNS15819-7	With reference to CNS15819-7

	Special safety	CNS15820-1 CNS15820-2 CNS15820-3	With reference to CNS15820-1 & CNS15820-2 & CNS15820-3
Lithium-ion battery	Safety guidelines	CNS15424-1 CNS15424-2	With reference to CNS15424-1 for detachable battery, CNS15425-2 for fixed battery
	Safety	CNS15387	With reference to CNS15387
	Weight		The weight of each detachable test battery shall not exceed 10kg.
Charging system		CNS15425-1 CNS15425-2	With reference to CNS1542-1 & CNS15425-2
Hydrogen storage tank safety		ISO 16111:2008	With reference to ISO 16111:2008-Transportable gas storage devices -- Hydrogen absorbed in reversible metal hydride

3 Subsidization policy for electric scooter in Taiwan [3]

In line with the Government's resolve to continue its energy conservation and carbon reduction policy, the Ministry of Economic Affairs (MOEA) of Taiwan has issued a subsidization policy for electric scooters to be expanded in the domestic market, and to drive their development and key components industry aggressively forward.

3.1 Subsidy items include qualified manufacturers, qualified electric scooters, and energy supplement facilities.

3.1.1 Qualified manufacturers must have (1) registered in Taiwan as an electric scooter maker, (2) capital in the amount of NT35 million or more, (3) an aftermarket service and maintenance system, (4) abilities for planning, design and setup for energy supplement facilities, (5) international quality assurance, and (6) annual sales of more than 600 units of electric scooters.

3.1.2 Qualified electric scooters must (1) be produced by qualified manufacturers, (2) have a license plate, and (3) have the TES certificate and follow the regulations for domestic production.

3.1.3 Qualifications for energy supplement facilities require that the energy supplement facilities for qualified electric scooters need to be accessible to the public, so facilities must be located in public areas, such as community centers, schools, stores, gas stations, post offices and sightseeing places.

3.2 Subsidy objects are (1) citizens of Taiwan wherein one person is limited to one subsidy, and (2) enterprises which have registered in Taiwan but for which the number of subsidies is not limited if its application is approved by the TES Committee. In addition, however, there are two notable exceptions to subsidy objects: Neither the domestic makers of the electric scooter nor the foreign manufacturers of agents are considered subsidy objects.

3.3 Subsidy for various categories, as shown in Table 2.

Table 2. Subsidy for various categories

categories	Subsidy	Extra subsidy for offshore islands use	Extra subsidy for domestic production
Heavy electric scooter	NT10,000	NT16,000	NT2,000
Light electric scooter	NT10,000	NT16,000	NT2,000
Small light electric scooter	NT7,000	NT7,000	NT2,000
Energy supplement facilities	Maximum NT300,000 per case		

4 Business models

Throughout the promotion of the above-mentioned strategies by the Taiwanese Government, two kinds of business models have been applied to the electric scooter: business to customer (B to C), and business to business (B to B).

4.1 B to C models

This is the TES-approved electric scooter model which the manufacturer is selling directly to consumers for their personal use. Consumers can get tax exemption for commodities and license, as well as purchasing subsidization from central and local governments. So far, eight manufacturers and forty-six models of the electric scooter have TES certificates, as shown in Figure 1. Although the quality and performance of the electric scooter have been improved enough to have become comparable to the 125cc gas-powered motorcycle, such as the Gogoro electric scooter, the cost of buying a new electric scooter is still too high, and the refueling system is still not well established. Therefore, the incentive was not strong enough to attract consumers to buy the electric scooter or to replace their own gas-powered motorcycle with it. Thus, the B to B selling model was proposed as the preferred choice because it was recognized for its potentially as a highly successful marketing strategy.



Figure 1. 8 manufacturers and 46 models of electric scooter have TES certificate [3]

4.2 B to B models

Many consumers who remain “old school” and adamantly against the electric scooter concept, could potentially hamper the popularization of the electric scooter from becoming widely used and successful. To avoid such jeopardy, the manufacturer has found a way to expand the electric scooter into other potential businesses, which is to directly sell the electric scooters to additional enterprises for their special business purposes, such as public usage within the company, patrolling metered parking spaces and “for pay” parking lots, parcel and food deliveries, postal deliveries, tourist rentals, and public car-sharing, as illustrated in Figure 2.




		
Tourists renting business in offshore islands	Environment Patrol	
		 
Parking Patrol	Parcel delivery	Postal delivery Food delivery

Figure 2. Special business purposes for B to B models.

5 Public car-sharing systems in metropolitan area

Among all of the businesses selling electric scooters, the public car-sharing model in the metropolitan area is regarded as the most important business opportunity in the future because it can significantly reduce air pollution and traffic jams in the metropolitan area. It can also provide shuttle transportation to public transport hubs, such as train and bus stations. Since the energy supply for the electric scooter is the key to the car-sharing business, two energy supply systems for public car-sharing have been initiated; one is already being piloted, and the other is being developed. They are a manual battery swapping system referred to as *WeMo* [3] and an automatically charging system referred to as *SwaGo*. All of the electric scooters operating in these two public car-sharing models are equipped with a detachable lithium-ion battery.

5.1 Manual battery swapping system-WeMo

WeMo is one kind of public car-sharing system without any fixed parking stations and can be easily rented and parked at any place by using the App service. Consumers can check the App to choose the nearest vehicle with enough battery capacity, as shown in Figure 3. At the same time, the consumer can make a reservation 10 minutes in advance by using the App. It takes less than one minute for each operation. The rental rate is 0.80 USD for the first 10 minutes, plus 0.08 USD per minute for additional drive time.

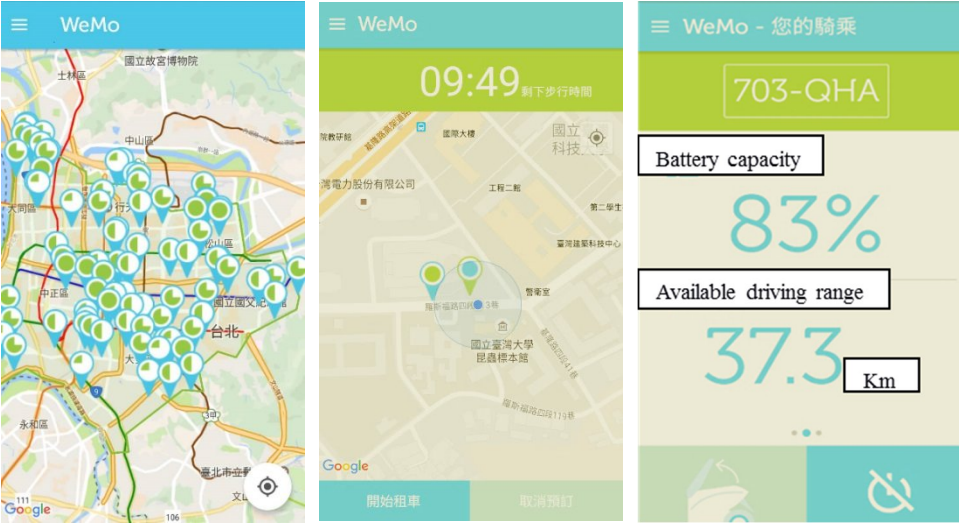


Figure 3. Screens show the (a) locations of vehicle marked with battery capacity, (b) enlarged locations of vehicle, and (c) battery capacity and available driving range on the user interface of App.

However, presently, the WeMo public car-sharing system needs someone to manually exchange the battery to maintain the battery capacity for each vehicle. Moreover, the “rent and return” electric scooter of the WeMo public car-sharing system is only valid within a confined zone. Once finished using the vehicle, the consumer must return it inside the confined zone. If the electric scooter is found parked outside that boundary, an extra fee will be charged to the consumer. Even though this system is convenient for consumers overall, the unregulated parking arrangement of electric scooters (as shown in Figure 4) and the parking violations fines are two big issues for this business model currently.



Figure 4. Unregulated parking of electric scooters in the parking lot.

5.2 Automatically charging system-SwaGo

The specialty of the SwaGo business model is its automatically clamping and charging system (as shown in Figure 5), which can charge any brand vehicle with different battery sizes as long as they are equipped with the same size front wheel. Therefore, there is no necessity to manually exchange the battery to maintain the battery capacity for each vehicle all of the time, except when the turnover rate is too high. Since the SwaGo system is similar to the WeMo system, consumers can easily use their App to search for the nearest station and to rent or return a vehicle. Moreover, all of the status information of each vehicle, each battery, and each charging station will be uploaded to the cloud server for better monitoring, easy access to information and permanent storage. This technology makes it possible for the SwaGo system to detect a vehicle, with a low battery, from the nearest station if it is located within its virtual fence. Consequently, the SwaGo system is not only available for applying it to public car-sharing, but also as an application to the B to B model.

Although the SwaGo system is still under development, many local governments have shown a strong interest in establishing the SwaGo system in the metropolitan area to reduce the air pollution and traffic jams.



Figure 5 Automatically clamping and charging system

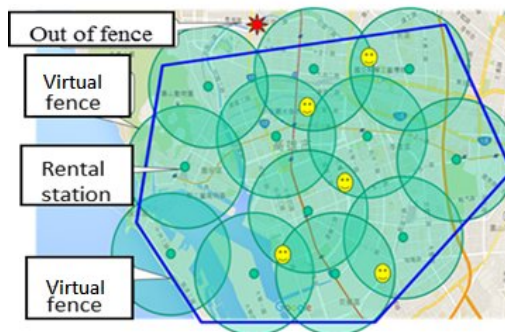


Figure 6. Virtual fence technology

6 Conclusion

Having undergone many years of continuous promotion on the development of the electric scooter by the Taiwanese Government, the electric scooter equipped with the lithium-ion battery became a reliable and safe vehicle in the Taiwanese market because of attention to quality control, safety, and monitoring of the aftermarket by TES. However, the shorter driving range of the electric scooter, as compared to the gas-powered motorcycle, is still an issue until it can be practicably extended to meet the consumers' expectations. In accordance, many business models have been initiated and piloted recently. It is believed that the battery swapping system and public car-sharing system (by automatically charging) can be the necessary solutions to extend the driving range of the electric scooter in the near future since neither of these two systems need a large space to set up their battery swapping stations and charging stations. It is, however, urgent to establish a common standard of interface communication protocol for the electric scooter manufacturers. Then, the lithium-ion battery made by different makers could be swapped at the battery swapping station or recharged at the automatically charging station. The goal of all strategies and the construction of battery swapping and public car-sharing systems is to provide a more convenient, reliable, economical, and environmentally friendly solution in congested metropolitan areas, which will attract more electric scooter users in the low-carbon emission cities. It is expected that aggressively pursuing this plan will ensure the electric scooter industry in Taiwan to flourish in the future considering the support of an abundance of promotional activities by the Taiwanese Government.

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