

Factors Affecting E-Scooter Sharing Purchase Intention: An Analysis using Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

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Abstract

Transportation uses a significant amount of energy and burns most of the world energy consumers. As a result, it affects the environment, such as air pollution in carbon dioxide, carbon monoxide, nitrogen oxide, hydrocarbons or volatile organic compounds, and particulate matter. These compounds contribute to a phenomenon called global warming. Within the transportation sector, road transport is the most significant contributor to global warming. To cope with global warming, environmental regulations in developed countries reduce individual vehicles' emissions. However, this has been counterbalanced by increasing the number of vehicles and increased use of each vehicle. Therefore, micro-mobility may alleviate several challenges facing big cities today and offer more sustainable urban transportation. This research utilizes the framework of the UTAUT2 to identify and build a quantitative approach to identify factors related to the purchase intention factors of e-scooter sharing. The 200 respondents' field data were collected in Jakarta Metropolitan Area (Jabodetabek) as a rapid increase in pollution level. The linear regression study revealed that the consumers' purchase intention of e-scooter sharing is shaped by seven main factors: performance expectancy, effort expectancy, social influence, facilitating condition, hedonic motivation, price value, and habit. Those factors can explain 81 per cent of the field data. Moreover, a brief recommendation for related stakeholders based on the research result is proposed to increase the adoption of e-scooter sharing. The practical implication of this analysis is suggested policy measures the e-scooter sharing environmentally impact potency and strengthening circular economy as a part of green economy achievement in the communities.

Keywords: *Behavioral Intention, Circular Economy, E-Scooter Sharing, and Jakarta*



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INTRODUCTION

Has identified the transportation sector as the main energy consumer and the biggest producer of greenhouse gasses around the world besides power [1]. This sector produces carbon dioxide (CO₂) as the main anthropogenic global warming culprit. Other than that, they also contribute to shorter-live pollutants contributing to climate change, among them gases that react to form ozone smog and particles. As such, the specific shortcomings in energy.

Efficiency in the transportation sector should be analyzed and addressed to save energy and decrease the emissions of black carbon and ozone-producing gases in addition to carbon dioxide.

Transportation technologies and strategies are emerging that can help to meet climate changes. These include automotive and fuel technologies, intelligent transportation systems, and mobility management strategies to reduce private vehicles' emissions. Hence, as one of the mobility management strategies, micro-mobility may take the edge of many challenges facing big cities and

could offer a pathway toward more sustainable urban transportation. The possible benefits are lower carbon footprint and less occupied road space.

This paper focuses on the acceptance factors for electric scooter-style motorcycles (e-scooters) that have entered many cities around the world on a large scale [4,5]. In parts of Asia, especially China and Southeast Asia, two-wheel and three-wheel e-scooters are playing an increasing role in electrifying transport. Early documented impacts of shared micro-mobility included increased mobility, reduced greenhouse gas emissions, decreased automobile use, economic development, and health benefits. Moreover, the economics of shared micro-mobility are largely favourable to industry participants due to the easiness to scale up assets compared with car-based sharing solutions. Thus, a business-case estimate of a leader in shared mobility shows that an e-scooter could break even in less than four months.

It is important to analyse and understand the various factors affecting the user's purchase intention of e-scooter sharing and to provide recommendations to increase the adoption of e-scooter sharing. Understanding the same will enable appropriate policies, marketing programs, and confidence-building measures for efficient, effective, and faster adoption of e-scooter sharing service. This research does a literature review to assess the behavioral models tested in the context of micro-mobility especially e-scooter sharing.

LITERATURE REVIEW

Transport planners are confronted with growing traffic volumes. Ever since the vehicle numbers have grown 122 million in 1960 [7] and continue to increase by about 78 million vehicles per year until 1.3 billion vehicles in 2014 [8]. In line with its high population, Jakarta Metropolitan Area, or Jabodetabek (Jakarta, Bogor, Depok, Tangerang, and Bekasi) also has high vehicle numbers. This is shown by the data which stated that, from 2010 to 2016, the number of cars increased around 2.3 million to 3.5 million while motorcycles, the number increased from approximately 8.7 million to 13.3 million [9]. This continuous rapid growth in vehicle kilometres travelled coupled with the rapid increase in traffic congestion. Drivers or passengers spend a significant and growing amount of travel time in slow traffic flow, especially during the morning and rush hours [10].

Vehicle emission, in many areas, has become the dominant source of air pollutants including and greenhouse gasses, including carbon dioxide (CO₂), carbon monoxide (CO), nitrogen oxide (NO_x), hydrocarbons (HCs) or volatile organic compounds (VOCs), and particulate matter (PM). The increasing duration and severity of traffic congestion have the potential to a great extent of greenhouse gasses and pollutant emissions which degrade air quality [11]. This poses a significant risk to human health by causing heart disease, lung cancer, stroke, chronic obstructive pulmonary disease, and acute respiratory infection [12]. Furthermore, this could lead to excess morbidity and mortality for drivers, commuters, and individuals living near major roads [11].

To ease congestion and to reduce the negative impacts of motorized transport, cities get down to reconsider their transport systems, look around to promote walking, cycling, and e-scooter sharing use as shared forms [6]. These micro-mobility forms complement multimodal mobility shared forms, for instance as hailing and public transportation [13, 14]. The Boston Consulting Group underlines that e-scooter sharing has a rapid rise of shared mobility that is also responding to the publics' need for cheap, convenient, and flexible ways to quickly get around increasingly congested cities [15]. While one study discussion of e-scooter barriers has focused on reduced

safety for other traffic participants, the lack of charging infrastructure, limited capacity to transport baggage, or adverse weather conditions that are a significant challenge for this transport mode [16].

As mentioned above, congested traffic has various negative effects ranging from health to environmental problems. Circular economy as a part of the green economy is focusing on waste and material use for human well-being. This type of economy is trying to promote a more sustainable way to do economic activity, such as lowering carbon footprints and maintaining the value of products and materials as long as possible [17]. Lowering carbon footprints are important since climate issues have been gaining concern from policy makers, scholars, and practitioners [18]. E-scooter sharing as the newest addition to the circular economy provides a chance to promote a low-carbon society [19]. But still in Jabodetabek, the adoption of e-scooter sharing is relatively low.

To understand the factors that drive users' purchase intention of e-scooter sharing, this research uses the UTAUT2 model to construct performance expectancy, effort expectancy, social influence, facilitating conditions, hedonic motivation, price value, and habit. Performance expectancy means the extent to which the usage of e-scooter sharing can provide consumers the advantages in performing specific activities. Effort expectancy refers to the degree of ease of use, which is associated with the usage of e-scooter sharing. Social influence is a degree of importance being recognized by others to use e-scooter sharing [20]. Facilitating conditions construct means a degree to which an individual believes that organization and a technical infrastructure exist to support the usage of e-scooter sharing [21]. Hedonic motivation could be defined as a motivation to do something because of the internal satisfaction [22], that reflects users' emotions, where the users tend to maximize their feeling of fun, joy, etc. [23]. Recently, price value can be defined as consumers' cognitive trade-offs between the monetary cost for using e-scooter sharing and perceived benefits of it. The habit could be defined as the degree to which users tend to perform the usage of e-scooter sharing behaviours automatically because of learning [20].

CONCEPTUAL FRAMEWORK AND MODEL

To research, the individual intention to use e-scooter sharing can be measured using the Universal Principle of Acceptance and Use of Technology 2 (UTAUT2) model. This conceptual model is developed based on the previous study by Venkatesh, Thong, and Xu (2012) of the acceptance model [20]. As shown in Figure 1, age, gender, and experience are not part of this study. Nonetheless, recent research studies by Mentaya et al (2015) have demonstrated that age, gender, and experiences do not substantially change the relationship between behavioural intention and use behaviour [24]. As shown in the figure 1, the following hypotheses are developed.

H1: Performance expectancy has positive and significant correlation to behavioural intention.

H2: Effort expectancy has positive and significant correlation to behavioural intention.

H3: Social influence has positive and significant correlation to behavioural intention.

H4: Facilitating conditions has positive and significant correlation to behavioural intention.

H5: Hedonic motivation has positive and significant correlation to behavioural intention.

H6: Price value has positive and significant correlation to behavioural intention.

H7: Habit has positive and significant correlation to behavioural intention.

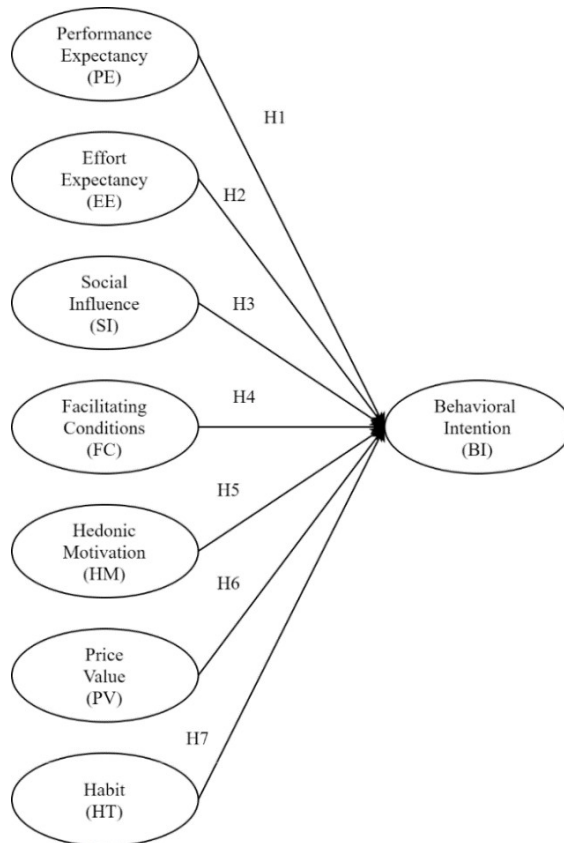


Figure 1. Conceptual Framework.

RESEARCH METHODOLOGY

A quantitative study was conducted to measure the relationships between variables identified in the prior section. Questionnaires were distributed among e-scooter sharing users in the Jakarta Metropolitan Area (Jabodetabek) by using convenience sampling. The data collection was conducted using online surveys and disseminated through various social media such as Twitter, Instagram, and Line Messenger. The measurement items were formulated as Likert-type statements anchored by a five-point scale, ranging from 1 (“strongly disagree”) to 7 (“strongly agree”).

Table I shows the example of questionnaire items. To examine the independent variables within the framework, we applied linear regression using SPSS 16 software. At the end of the data collection period, 200 usable responses were received to be analysed further. Table II presents the demographic statistics for data collected.

Table I: Example of Questionnaire Items

Construct	Code	Item
Performance Expectancy	PE1	I find electric scooters useful in my daily life.
		Using an electric scooter increases my
	PE2	chances of achieving things that are important to me.
	PE3	Using an electric scooter helps me accomplish things more quickly.
	PE4	Using an electric scooter increases my productivity.

Table II: Respondents Demographic Profile

Demographic Variable		Frequency	Percentage
Region	Jakarta	87	44%
	Bogor	25	13%
	Depok	33	17%
	Tangerang	6	3%
	Tangerang Selatan	42	21%
	Bekasi	7	4%
E-scooter usage	GrabWheels	114	57%
	Gowes	26	13%
	Both	27	14%
	Never	33	17%
Purpose	Commute	21	11%
	Leisure	140	70%
	Shopping	6	3%
	Never	33	17%
Gender	Male	74	37%
	Female	126	63%
Age	18-21	180	90%
	>= 22	20	10%
Occupation	Civil servants	8	4%
	Student	166	83%
	Employee	9	5%
	Professional	10	5%
	Entrepreneur	7	4%
Latest Education	Middle School	6	3%
	High School	141	71%

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Income (in Rupiahs)	Bachelor	53	27%
	Below 2.000.000,-	73	37%
	2.000.000 - 2.999.999	60	30%
	3.000.000 - 3.999.999	14	7%
	4.000.000 - 5.999.999	19	10%
	6.000.000 - 6.999.999	7	4%
Vehicle Owned	Above 7.000.000	27	14%
	Car	59	30%
	Motorcycle	47	24%
	Both	40	20%
Most Used Mode	Do not have	54	27%
	Walking	14	7%
	Motorcycle	41	21%
	Car	71	36%
	Motorcycle ride-hailing	40	20%
	Car ride hailing	8	4%
	Bus	10	5%
Rail	9	5%	

RESULTS AND DISCUSSIONS

A. Regression Analysis

It is imperative to quantitatively link the adoption factors with the purchase intention of the consumers as purchase intention is considered a precursor to behavioural intention. By appropriately addressing these adoption factors, the e-scooter stakeholders can aim to improve their penetration of this potent, emerging market opportunity. Prior to regression analysis, classical assumption test has been carried out.

Table III: Linear Regression Result

Variable	B	t-value	Sig. (p-value)
(Constant)	0.993	0.912	0.363
H1 PE	0.432	11.583	0.000
H2 EE	0.148	2.648	0.009
H3 SI	-0.098	-2.097	0.037
H4 FC	-0.312	-7.207	0.000
H5 HM	-0.023	-0.370	0.712
H6 PV	0.283	4.346	0.000
H7 HT	0.313	7.588	0.000

Dependent Variable: BI

Regarding the hypothesis testing results, supported hypotheses results are drawn if t-value is above 1.96, and p-value is below 0.05. Not supported hypotheses results are drawn if t-value is below or equal to 1.96 and p-value are equal to or above 0.05.

Since H1, H2, H3, H4, H6, and H7 are supported, this indicates performance expectancy, effort expectancy, social influence, facilitating conditions, price value and habit are the significant variable determining behavioral intention of e-scooter sharing adoption. This is in line with the previous research from [31] which stated those factors are significant in determining behavioral intention of technological product adoption. Only H5 is not supported. This indicates hedonic motivation is not the factors affecting the adoption of e-scooter sharing.

The linear regression equation can be drawn up as below:

$$Y = b_0 + b_1 \cdot x_1 + b_2 \cdot x_2 + b_3 \cdot x_3 + b_4 \cdot x_4 + b_5 \cdot x_5 + b_6 \cdot x_6 + b_7 \cdot x_7$$

where:

Y = dependent variable

b₀ = regression constant

b₁, b₂, ... = regression beta values

x₁, x₂, ... = independent variables or predictors

From the results shown in the table III, the regression equation can be stated as follows:

$$BI = 0.993 + 0.432 \cdot PE + 0.148 \cdot EE - 0.098 \cdot SI - 0.312 \cdot FC - 0.023 \cdot HM + 0.283 \cdot PV + 0.313 \cdot HT$$

In other words, it can be inferred when performance expectancy increase by 1 unit, it will increase the behavioral intention by 0.432 units.

CONCLUSIONS

Increasing adoption of e-scooter is needed to cope problem in transportation sector, especially one that related to environmental concern. The factors that affect the adoption including performance expectancy, effort expectancy, social influence, facilitating conditions, price value and habit.

RESEARCH RECOMMENDATION

Throughout the world, cities seek to ease transport-related problems of congestion, air pollution, noise, and traffic injuries, including many urban cities in Indonesia. Urban transport planners have welcomed e-scooters as an alternative to motorized individual transport, specifically the car. The Indonesian public has met e-scooters with both enthusiasm and scepticism, as cities have struggled with unforeseen outcomes such as forms of irresponsible riding, cluttering, or vandalism [25]. This paper investigates and results in the potency and challenges associated with the adoption of e-scooters in the Jabodetabek area in relations with achieving green economy

through renewable energy. Therefore, it's needed to make a more comprehensive further recommendation in relation to this research result on how Indonesia stakeholders respond to this e-scooter potency and start to react in forms of regulation and related strategy. The writer tries to propose a quadruple-helix recommendation which consists of government, private sector, public society, and social media roles in advancing the e-scooter development for creating green economy industry in transportation sectors also help the renewable energy adoption towards people.

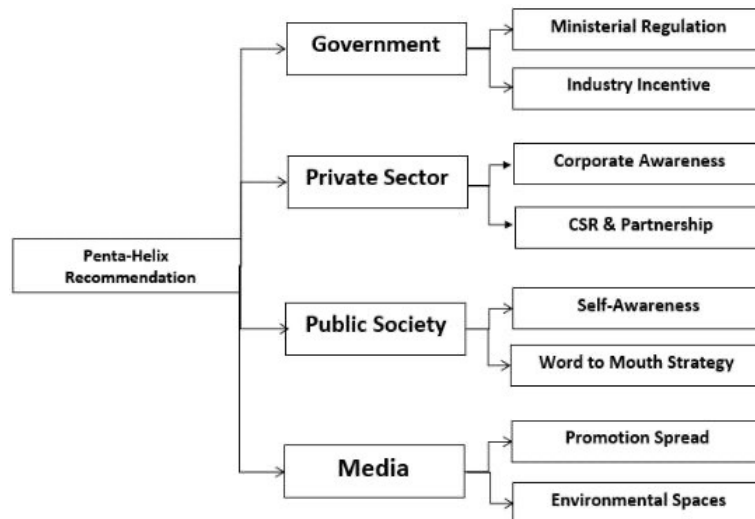


Figure 2. Quad-helix Recommendation

Governments as main regulators for the nation's effort in creating renewable energy and green economy achievement have to set firm regulations at ministerial level in order to manage more specific cases which also consist of industry incentive for instance in e-scooter public use. This recommendation is also supported by existing regulations such as UU No. 40 Tahun 2007 and POJK 51/2017 that empower public and private companies to disclose their social and environmental responsibilities to the society [26].

Moreover, based on our research result, facilitating condition and performance expectations has a significant impact on encouraging e-scooter sharing purchase and usage which the government can optimize this area as a regulator. Therefore, there are three ministries that need to be recommend in doing certain actions to captured the rising of e-scooter potency, which are ministry of transportation, energy and mineral resources, and finance.

For ministry of transportation, it is required to set up firm regulations about e-scooter using urban cities in Indonesia, especially for most-polluted cities. Besides, to promote and socialize the new regulations, ministry can open partnership participation for the public sector to enter the e-scooter supply also all infrastructure end-to-end (battery, charging stations, etc).

For ministry of energy and mineral resources, it is required too to set up firm regulations about renewable energy creation, funding, and governmental support to create a demand and supply flow especially for the renewable energy market.

For ministry of finance, it is importance to set up a special budget for renewable energy creation and green economy business operation (e-scooter) and creating an incentive for state-

owned enterprise in using renewable energy products, such as e-scooter. Therefore, to summarize, each ministry has to identify related industries, for example in the form of money incentive, tax relaxation, funding and partnership support to escalate industrial sectors in more environmentally-friendly ways, especially using e-scooter in every possible way [27]. Giving incentive to industry is an effective way in doubling e-scooter using the market because industry scope users are widest in Indonesia.

Governmental roles are not enough to achieve a green economy in the end, the private sector also had an important role in adopting e-scooter sharing and encouraged the purchase intention at least to the employee then to the bigger scope of industry through corporate awareness and CSR (Corporate Social Responsibilities) & partnership. Corporate awareness can be achieved through setting up a green - awareness program towards the employee, for example using e-scooter (especially corporate in business district area, very possible to use e-scooter) also intensify employee for more environmental aware. Corporate awareness can be supported by held a CSR Program especially for creating awareness in using environmental-friendly transportation, such as e-scooter and bicycle. CSR engagement can be accelerated more through partnership with green initiatives/community in giving management an awareness training.

Moreover, public society and media as the target users also have to make an effort in adopting e-scooter sharing and create the purchase intention among the people as social influence and habit being the significant factor too. They have to building a digital awareness of purchase and using e- scooter sharing as part of environmental-friendly transportation in creating renewable energy society and achieving green economy, which in detail below:

Table IV: Strategy to Improve E-Scooter Adoption

Strategy	Promotional Spread	Environmental Spaces
Proposed Action and Regulations	<ul style="list-style-type: none"> - Capturing the trend of e- scooter use in public (university and business district) to trigger public society in using e-scooter too. - Make a documentary of how e-scooter could be the solution in tackling urban cities transportation pollution especially in <i>Jabodetabek</i> 	<ul style="list-style-type: none"> - Make a special environmental-content in forms of video or posts in creating digital natives awareness towards achieving a green economy and stuff about renewable energy.
Strategy	Self-Awareness	Word of Mouth Strategy

<p>Proposed Action and Regulations</p>	<p>- Try to growing and develop self-awareness to using more greener transportation, facility, and accommodation such as e- scooter, bicycle, or walk.</p> <p>- Doing a small action everyday related to decreasing environmental negative impact, such as pollution, global warming, etc.</p>	<p>- Spread awareness towards little chit-chat in incurring domino effect in using e-scooter or other greener transportation.</p>
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Hopefully, the quadruple-helix recommendation can be adapted by relevant stakeholders to see and start to develop this e-scooter trend as a way to improve the efficiency of renewable energy awareness and achieving green economy through e-scooter potential end-to-end market. The recommendation also being the extended feasible-solutions to optimize the significant factors of e-scooter sharing purchase intention.

POLICY IMPLICATIONS

The e-scooter implementation and quad-helix recommendation must affect several areas of improvement that need to be realized by relevant stakeholder, such as:

- **Firmed Regulations:** E-scooter potency and development required exact regulations of how the end-to-end market will operate in Indonesia. Right now, there are no further regulations about the e-scooter industry, in terms of incentives and threats [28].
- **Business opportunities:** The potency is big; many businesses want to enter and serve this market demand [29]. But there is a need for more in-depth research on how this end-to-end e-scooter implementation works in Indonesia. From the official supplier, battery and charging stations provider, also another sub-part of the e-scooter business. This was dependent on firm regulations that needed to be done by the government and relevant stakeholder.
- **Geographical Condition:** The Indonesian market towards e-scooter use is quite big, but there are several obstacles that need to be tackled first, especially the physical condition. Many roads in urban cities are not supporting e-scooter use, only in business districts and high-end road areas that support e-scooter use [30]. There needs to be a comprehensive agenda in making more suitable physical road conditions in accelerating the use of e-scooter in Indonesia, especially in urban cities (Jabodetabek).

RESEARCH CONTRIBUTIONS

This research contributes to giving a comprehensive view of how e-scooter implementation in Indonesia can be a tool to create business opportunities in the green economy area through utilizing renewable energy efficiency. Moreover, there is also a structured recommendation of how the research result can be interpreted by relevant stakeholders to make an initial effort and strategy in adoption of e-scooter.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This research have many limitations during the conduction, such as :

- Research Scope

Research Location : This research only highlights Jakarta, Bogor, Depok, Tangerang, and Bekasi (Jabodetabek) areas; we are not conducting outside of this area which also have an impact on research results.

Respondent : Only 200 respondents are used as samples for quantitative measures on how e-scooter can be a new potential of green economy business opportunities in Indonesia, therefore the research significance is limited.

Literature Review : In relation with the limited Indonesia's literature review about e-scooter development, the writers depend on benchmarking from foreign literature.

- Proposed Recommendation

1) The quad-helix recommendation only highlights the Indonesia side. The international engagements and agreement towards e-scooter development are not included. This research only highlights how Indonesia can capture, respond, and make an action towards e-scooter potency through benchmarking in successful countries like Taiwan. Authors should expect to be challenged by reviewers if the results are not supported by adequate data and critical details.

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APPENDIX

Appendixes, if needed, appear before the acknowledgment.

TABLE VI: QUESTIONNAIRE ITEMS

Construct	Code	Item
Performance Expectancy	PE1	I find electric scooters useful in my daily life.
	PE2	Using an electric scooter increases my chances of achieving things that are important to me.
	PE3	Using an electric scooter helps me accomplish things more quickly.
	PE4	Using an electric scooter increases my productivity.
Effort Expectancy	EE1	Learning how to use electric scooter is easy for me.
	EE2	My interaction with electric scooter is clear and understandable
	EE3	I find electric scooter easy to use
	EE4	It is easy for me to become skillful at using electric scooter.
Social Influence	SI1	People who are important to me think that I should use electric scooter.
	SI2	People who influence my behavior think that I should use electric scooter.
	SI3	People whose opinions that I value prefer that I use electric scooter.
Facilitating Condition	FC1	I have the resources necessary to use electric scooter
	FC2	I have the knowledge necessary to use electric scooter.
	FC3	Electric scooter is compatible with other technologies I use
	FC4	I can get help from others when I have difficulties using electric scooter.
Hedonic Motivation	HM1	Using electric scooter is fun.
	HM2	Using electric scooter is enjoyable.

	HM3	Using electric scooter is very entertaining.
Price Value	PV1	Electric scooter is reasonably priced
	PV2	Electric scooter is a good value for the money
	PV3	At the current price, electric scooter provides a good value
Habit	HT1	The use of electric scooter has become a habit for me.
	HT2	I am addicted to using electric scooter.
	HT3	I must use electric scooter.
	HT4	Using electric scooter has become natural to me
Behavioral Intention	BI1	I intend to continue using electric scooter in the future
	BI2	I will always try to use electric scooter in my daily life.
	BI3	I plan to continue to use electric scooter frequently.
