



Factors Affecting Consumers' Decision to Buy Battery Electric Vehicles in Bangkok and Metropolitan Area

Kanchanik Kumnerdpetch

Graduate College of Management, Sripatum University, Bangkok 10900, Thailand

Corresponding author. E-Mail address: kanchanikp@gmail.com

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Abstract

This research aimed to study: 1) the factors of the marketing mix affecting consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area; 2) the factors of technology acceptance affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area; 3) the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area; and 4) analyze the factors affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area. Samples included people who lived in Bangkok and Metropolitan Area. They were selected by sample random sampling. The descriptive statistics were percentage, average and standard deviation. The inferential statistics used was multiple regression analysis.

The results showed that: 1) the factors of the marketing mix affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area were found overall at a high level that product (after-sales service) was the first persuasive factor to buy battery electric vehicles; 2) the factors of technology acceptance affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area were found overall at a high level; 3) the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area were found overall at a high level; 4) the analysis of the factors the affecting consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area revealed that product, technology acceptance in intention to use, attitude toward using and actual use all influenced the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area were at the statistically significant at 0.05 level.

Keywords: Marketing Mix, Technology Acceptance, Decision to Buy, Battery Electric Vehicle, Bangkok and Metropolitan Area

Introduction

Emergences of Electric Vehicles (EVs) driven by electric batteries with the merits of environmental friendly have led to the likely increasing and rapid expansion of electric vehicles worldwide. Accordingly, a number of agencies, namely Bloomberg New Energy Finance (BNEF), BP, OPEC, ExxonMobil, International Energy Agency (IEA) have forecasted the growth of electric vehicles in the next 20 years that the trend of high growth will be between 17%–26% a year; there will be electric vehicles running on the streets worldwide for 150–550 vehicles within 2040, accounts for the proportion between 31%–55% of total vehicles sale volumes (Khantachavana, 2019). Furthermore, according to the research of Frost & Sullivan (n.d.) which studies the future of electric energy vehicles in South East Asia revealed that there was currently a small number of electric vehicle users however, the demand of electric vehicles in Thailand were as high as 44%.

The growth of electric vehicles may cause the demand slowdown of fuel in the next 10 years which inevitably deems as the negative and challenging effect against the fuel business. For these reasons, world leading fuel companies as well as in Thailand have increasingly expanded their investment in the businesses relating to the electric energy throughout the Value Chain from the upstream business namely electricity generation from alternative energy such as solar power, wind power including the battery business for Energy Storage to downstream business like electric charging station to support the growth of electric vehicles (Khantachavana, 2019).



In consideration upon the decision making to buy electric vehicles in Thailand in substitute of fuel vehicles, it was found that the incentives that influence consumers to buy the Hybrid Electric Vehicles (HEV); the automobiles with the combination of fuel and electric energy consumption and Plug-In Hybrid Electric Vehicle: (PHEV) were namely the reliability of the automobile manufacturer companies, the convenience of services provided, and the marketing mix factors (Hattakee & Wangjiraniran, 2012; Chuemchuthitham, 2014; Bunjongmanee, n.d.). Whereas, the researches on Battery Electric Vehicle (BEV) which is the vehicles driven by electric motors and batteries in substitute of fuel are seldom, it was found that the worthiness in term of price had positive effect to the intention to buy the battery electric vehicles (Deekhum, 2017) and the intention to use directly influenced to the innovation and technology acceptance factors (Leelaphatthanawong & Pinvanichkul, 2019). As a result, there was rare body of knowledge to be used as the incentives for the decision to buy battery electric vehicles, only the marketing mix in term for price and intention to utilize. Whereas the factors of after sale service that will entrust customers and rely on the use of such vehicles in the long terms which deems as the key factor for decision to buy, there is none of reference on the battery electric vehicles and only some on the hybrid electric vehicles. As a matter of facts, the battery electric vehicles are driven by 100% electric energy without any electric engine and using motors as energy to drive the vehicles moving (Thailand Automotive Institute, n.d.). Thus, battery electric vehicles have less parts than vehicles driven by general internal combustion engines (vehicles that consume Benzenes and Diesel), resulting in much easier for seeking parts for repair and maintenance (Glassman555, 2019).

However, the automobile industry has been the target industry of the government to have policies towards development and support for electric driven automobile manufacturing to help promoting Thai automobile industry to come into the era of Thailand Industry 4.0. The planned period of the development project was during 2016–2036 and the electric vehicle was projected as the Product Champion. It has been anticipated that in 2036 electric vehicles will completely substitute fuel vehicles for 1.2 million (Yongpisanphob, 2018). However, the expansion has been too slow despite electric vehicles reduce fuel consumption and are environmental friendly (Ekachai, 2019).

Therefore, the researcher studies the factors affecting consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area to figure out the factors or incentives that urge consumers to make decision to buy battery electric vehicles to be used in marketing planning and new business expansion for automobile entrepreneurs and government agencies in order to cope with the growth of the battery electric vehicles since they become widely popular and will be the future vehicles immediately after the plug-in hybrid electric vehicles (Editorial, Article and Documentary Formula, 2018). This will role as the great support to Thai automobile industry to enter the era of Thailand Industry 4.0 and become the hub of electric vehicles of the region in the future which will lead to stable and sustainable prosperity of the country's economic.

Research Objectives

1. To study the factors of the marketing mix affecting consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area
2. To study the factors of technology acceptance affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area
3. To study the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area
4. To analyze the factors affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area

Methodology and Materials

Study Method and Scope of the Research

This research was a quantitative research conducting a survey using the created questionnaire and the scope of the research was determined as follows:

Scope of the Research

Scope of Population were consumers living in Bangkok and Metropolitan Area.

Samples were 400 consumers living in Bangkok and Metropolitan Area which the minimum figure derived by using Yamane table with the reliability of 95%, errors of 5% or less. However, in order to get higher validity and less errors of the research, the researcher increased 20 more samples, thus the total samples for data collecting were 420.

Scope of the Content consists of Marketing Mix, Technology Acceptance and Decision to buy.

Scope of Area were Bangkok and Metropolitan Area.

Research Tool was a questionnaire consisting of four parts. **Part 1** surveys items on personal information which was Check List type. **Part 2** surveys items on marketing mix factors affecting the decision to buy battery electric vehicles of consumers living in Bangkok and Metropolitan Area. **Part 3** surveys items on technology acceptance factors affecting the decision to buy battery electric vehicles of consumers living in Bangkok and Metropolitan Area. **Part 4** surveys items on decision to buy battery electric vehicles of consumers living in Bangkok and Metropolitan Area. The items in Parts 2, 3 and 4 were Likert Scale's 5-rating scales based on the criteria that the range of each rating scale are all the same. After setting the levels from Highest, High, Medium, low, Lowest as no. 5, 4, 3, 2 and 1, respectively, the range was $5-1 = 4$, with the average of each range at $4/5 = 0.8$.

Data Collection Method

Data were collected using the questionnaire with consumers living in Bangkok and Metropolitan Area through the Sample Random Sampling method of which samples had an equal chance to be selected randomly on convenience and voluntary to reply.

Data Analysis Method

1. The data analysis for personal information was done by using percentage. Regarding the data analysis for Research Objectives 1, 2 and 3, Mean, Standard Deviation with the criteria for Mean interpretation were applied: 1) Mean 4.21–5.00 refers to Highest level, 2) Mean 3.41–4.20 refers to High level, 3) Mean 2.61–3.40 refers to Medium level, 4) Mean 1.81–2.60 refers to Low level and 5) Mean 1.00–1.80 refers to Lowest level.
2. The data analysis for Research Objective 4, the hypothesis was verified by testing the factors affecting the decision to buy battery electric vehicles of consumers living in Bangkok and Metropolitan Area using Multiple Regression Analysis.

Research Findings

Since there were 420 samples, the researcher collected data from 412 samples, which accounted for 98.1%; thus there were eight samples missing due to involuntary or uncooperative of informants. However, the collected data were higher than the acceptable minimum with the statistical significance at 0.05 level with 400 samples. The data collection, therefore, could be used for the analysis and the representation of the study.



The results of personal data analysis of samples revealed that most of them were females, age between 31–40 years old with bachelor degree graduation, having monthly income lower than 30,000 TH Baht, working as public enterprises officers, living in Bangkok and using vehicles in average of 50 km or less per day.

Table 1 Level of Opinions on Marketing Mix Affecting Decision to Buy Battery Electric Vehicles

Marketing Mix	Mean	Standard Deviation (S.D.)	Interpretation
Product Aspect	4.49	.537	Highest
1. Decision to buy battery electric vehicles because of availability of guarantee after sale such as a battery guarantee for 8 years or vehicle usage of 160,000 km. and electric system guarantee for 5 years or vehicle usage of 100,000 km.	4.57	.700	Highest
2. Electric vehicles having the environmental friendly property which does not generate dust as the air pollution	4.56	.689	Highest
3. The well-known makes of electric vehicles contribute to the decision to buy electric vehicles	4.50	.759	Highest
4. The uniqueness for engine noiseless (Silence) of electric vehicles contributes to decision to buy battery electric vehicles	4.32	.827	Highest
Price Aspect	4.26	.751	Highest
5. The prices of electric vehicles are worthiness in comparison to the price you paid	4.38	.881	Highest
6. The prices of electric vehicles are appropriate to their properties	4.37	.829	Highest
7. The prices of electric vehicles are the key factors of your decision to buy them	4.35	.943	Highest
8. The prices of electric vehicles are variety to choose	3.94	1.117	High
Distribution Channels Aspect	4.04	1.055	High
9. The availability of standard garages in countrywide to support in providing maintenance services of electric vehicles makes you worry-free concerning the potential problems of electric vehicles usage in the future	4.14	1.109	High
10. The availability of EV charging stations which have convenient access	4.05	1.251	High
11. The availability of sufficient EV charging stations	4.03	1.274	High
12. A number of electric vehicles dealer outlets	3.92	1.126	High
Marketing Promotion Aspect	4.00	1.054	High
13. The availability of service centers in countrywide for convenient access	4.16	1.126	High
14. The availability of staff giving advices of electric charging at each EV charging station	3.96	1.188	High
15. The availability of marketing promotion of EV charging stations such as vouchers, discounts and premiums etc.	3.95	1.129	High
16. The availability of public relation through media to educate and create confidence in using the electric vehicles	3.93	1.108	High
Total	4.20	.707	High

According to Table 1, it was found that the marketing mix factors affecting the decision to buy battery electric vehicles had the opinion in overall in the High level with the average of 4.20. In consideration to each aspect under the marketing mix, it was found that consumers gave precedence to the marketing mix factors in the Product aspect in the top range, followed by the aspect of Price, Distribution Channels and Marketing Promotion, respectively.

In consideration of each item from Highest to Lowest average, according to the analysis criteria, it was found that;

Product Aspect The decision to buy electric vehicles due to the availability of after sale guarantee had the Highest opinion with the average of 4.57, followed by the property in environmental friendly was in the Highest level with the average of 4.56, the well-known makes of electric vehicles was in the Highest level with the average of 4.50, and the uniqueness for its engine noiseless (Silence) was in the Highest level with the average of 4.32, respectively.

Price Aspect The worthiness was in the Highest level with the average of 4.38, followed by Prices are appropriate to the properties of electric vehicles was in the Highest level with the average of 4.37, Prices are the key factor contributing to your decision to buy was in the Highest level with the average of 4.35, and there are variety of prices to choose was in the High level with the average of 3.94, respectively

Distribution Channels Aspect The availability of standard garage in countrywide was in the High level with the average of 4.14, followed by the availability of EV charging station for convenient access was in the High level with the average of 4.05, the availability of sufficient EV charging station was in the High level with the average of 4.03, and there are a number of electric vehicle dealer outlets was in the High level with the average of 3.92, respectively

Marketing Promotion Aspect The availability of service centers in countrywide was in the High level with the average of 4.16, followed by the availability of staff to give advices for electric charging at each EV charging station was in the High level with the average of 3.96, the availability of marketing promotion of the EV charging stations was in the High level with the average of 3.95, and the availability of public relation through media to educate and create confidence in using the electric vehicles was in the High level with the average of 3.93, respectively.

Table 2 Level of Opinions on Technology Acceptance Affecting Decision to Buy Battery Electric Vehicles

Technology Acceptance	Mean	Standard Deviation (S.D.)	Interpretation
Perceived Usefulness Aspect	4.33	.683	Highest
1. Electric vehicles are innovation (Technology) that consume alternative energy so they help lessen global warming condition	4.49	.723	Highest
2. Electric vehicles help saving costs of fuel consumption	4.41	.834	Highest
3. Electric vehicles help saving more costs of maintenance than the usage of vehicles driven by general internal combustion engines (vehicles consuming Benzene and Diesel) since Electric vehicles have no engine and no oil change required	4.08	.981	High
Perceived Ease of Use Aspect	4.27	1.198	Highest
4. Electric charging method of electric vehicles is convenient, just plugging in to the vehicles and unplugging before usage	4.38	2.690	Highest
5. The electric vehicles can be charged with household electric system	4.36	.890	Highest
6. There are a number of EV charging station in Bangkok and in up-countries for convenient services	4.07	1.138	High

**Table 2** (Cont.)

Technology Acceptance	Mean	Standard Deviation (S.D.)	Interpretation
Perceived Risk Aspect	4.24	.864	Highest
7. You perceive that the battery price of electric vehicle is higher than of general vehicle	4.31	.934	Highest
8. You perceive that the driving distance per an electric charge is still the weak point for long distance travel because the electric vehicles have limited containing capability batteries.	4.28	.990	Highest
9. You perceive that each electric charging period of electric vehicles take longer than fuel filling	4.12	1.094	High
Intention to Use Aspect	4.08	.885	High
10. You intend to use the electric vehicle because it is an automobile technology driven by an alternative energy which deems as the clean energy for environmental conservation	4.13	.943	High
11. You intend to use the electric vehicle because of its standard safety	4.09	1.012	High
12. You intend to use the electric vehicle because it is more worthy than using the vehicle driven by general internal combustion engine (vehicle consuming Benzene and Diesel) in comparison by their used distances	4.03	1.004	High
Attitude Toward Using Aspect	4.01	.812	High
13. Use of the electric vehicle help you contribute to the traffic noise pollution reduction since the electric vehicle creates noise about 21 Decibels, while the engine that consumes Benzene or Diesel creates noise about 76 Decibels	4.21	.911	Highest
14. The use of electric vehicle help you contribute to lessen fuel import volume of the country from foreign countries	4.14	.915	High
15. The use of electric vehicle make you up to date	3.68	1.129	High
Actual Use Aspect	4.00	.879	High
16. When using the electric vehicle, you can feel the silence since there is no noise like general engine	4.20	.900	High
17. The electric vehicle has a fast accelerating rate since it has no need for accelerating in work cycles like general engine	3.93	1.021	High
18. The electric vehicle has been tested for its safety to drive on water flooding surfaces as high as the vehicle itself without any electric short circuit occurred	3.86	1.112	High
Total	4.15	.665	High

Table 2 shows that the factors of Technology Acceptance affecting the decision to buy battery electric vehicles in overall was in the High level with the average of 4.15. In consideration to each aspect, it was found that consumers gave precedence to the factors of Technology Acceptance in Perceived Usefulness aspect in the top range, followed by the aspect of Perceived Ease of Use, Perceived Risk, Intention to Use, Attitude Toward Using and Actual Use, respectively.

In consideration of each item from Most to Least of average according to the analysis criteria, it was found that; **Perceived Usefulness Aspect** The electric vehicle contributes to lessen global warming condition was in the Highest level with the average of 4.49, followed by saving the costs of fuel consumption was in the Highest level with the average of 4.41, and saving more costs of maintenance than the usage of vehicles driven by general internal combustion engines was in the Highest level with the average of 4.08, respectively.

Perceived Ease of Use Aspect The convenience of charging method of the electric vehicle was in the Highest level with the average of 4.38, followed by The capability of charging with household electric system was in the Highest level with the average of 4.36 and the availability of EV charging station in Bangkok and in up-countries for convenient services was in the High level with the average of 4.07, respectively.

Perceived Risk Aspect The battery price of electric vehicle is higher than of general vehicle was in the Highest level with the average of 4.31, followed by the driving distance per an electric charge is still the weak point for long distance travel was in the Highest level with the average of 4.28, and each electric charging period of electric vehicles take longer than fuel filling was in the High level with the average of 4.12.

Intention to Use Aspect The electric vehicle is driven by the clean energy for environmental conservation was in the High level with the average of 4.13, followed by the electric vehicle has standard safety was in the High level with the average of 4.09 and the electric vehicle is more worthy than using the vehicle driven by general internal combustion engine was in the High level with the average of 4.03.

Attitude Toward Using Aspect The traffic noise pollution reduction was in the Highest level with the average of 4.21, followed by lessen fuel import volume of the country from foreign countries was in the High level with the average of 4.14 and the use of electric vehicle make you up to date was in the High level with the average of 3.68.

Actual Use Aspect When the use of electric vehicle can feel the silence since there is no noise like general engine was in the High level with the average of 4.20, followed by its fast accelerating rate was in the High level with the average of 3.93, and its safety to drive on water flooding surfaces as high as the vehicle itself without any electric short circuit occurred was in the High level with the average of 3.86.

Table 3 Level of Opinions on Decision to Buy Battery Electric Vehicles

Decision to Buy Battery Electric Vehicles	Mean	Standard Deviation (S.D.)	Interpretation
Evaluation of Alternatives Aspect	4.32	.835	Highest
1. Reliability of the automobile makes influencing your decision to buy electric vehicle	4.38	.889	Highest
2. You always compare properties of each electric vehicle make before making decision to buy	4.27	.966	Highest
3. Reputation of vehicle makes influencing to your decision to buy	4.27	.966	Highest
Purchase Decision Aspect	4.17	.808	High
4. The main reason for you to buy an electric vehicle is the new technology for energy saving	4.28	.875	Highest
5. You decide to buy an electric vehicle because you are aware of the air pollution issue	4.13	.967	High
6. The distance that an electric vehicle can run per each electric charging is sufficient for your traveling need in each day	4.10	1.017	High
Information Search Aspect	4.13	.933	High
7. You make a research before making decision to buy an electric vehicle from media like newspaper, TV., and website etc.	4.27	.988	Highest
8. You ask for information about the electric vehicle from surrounding people before making a decision to buy	4.12	1.052	High
9. You always follow updating news of electric vehicles for your favorite makes	4.00	1.105	High

**Table 3** (Cont.)

Decision to Buy Battery Electric Vehicles	Mean	Standard Deviation (S.D.)	Interpretation
Problem Recognition Aspect	4.10	.902	High
10. In order to solve the pollution crisis of PM 2.5 dust, generated from exhaust of fuel consuming vehicles, electric vehicles should be in place of them	4.12	.946	High
11. In order to reduce the use of energy from fossil fuel, the electric vehicles should be used for solving such problem since they do not consume fuel	4.12	.949	High
12. In order to solve the global warming problem, the electric vehicles should be used since it is the duty of us all to solve such problem	4.07	1.006	High
Post Purchase Behavior Aspect	4.00	.932	High
13. In the future if you have a chance, you intend to have your family members using the electric vehicles	4.06	.977	High
14. In the future if you have a chance, you will use the electric vehicles instead of fuel vehicles	4.02	1.051	High
15. You will recommend people you know to use the electric vehicles	3.91	1.012	High
Total	4.14	.754	High

In Table 3, it reveals that the decision to buy battery electric vehicles in overall was in the High level with the average of 4.14. In consideration to each aspect, it was found that consumers gave precedence in making decision to buy battery electric vehicles to the aspect of evaluation of alternatives in the top range, followed by the aspect of Purchase Decision, Information Search, Problem Recognition, and Post Purchase Behavior, respectively.

In consideration of each item from Most to Least of average according to the analysis criteria, it was found that; **Evaluation of Alternatives Aspect** Reliability of the automobile was in the Highest level with the average of 4.38, followed by comparing properties of each electric vehicle make before making decision to buy was in the Highest level and Reputation of vehicle makes with the same average of = 4.27.

Purchase Decision Aspect The new technology for energy saving was in the Highest level with the average of 4.28, followed by aware of the air pollution issue was in the High level with the average of 4.13 and the distance that an electric vehicle can run per each electric charging is sufficient for the traveling need in each day was in the High level with the average of 4.10, respectively.

Information Search Aspect Making a research before making decision to buy an electric vehicle from media was in the Highest level with the average of 4.27, followed by asking for information about the electric vehicle from surrounding people before making a decision was in the High level with the average of 4.12 and following updating news of electric vehicles for the favorite makes, was in the High level with the average of 4.00.

Problem Recognition Aspect To solve the pollution crisis of PM 2.5 dust and to reduce the use of energy from fossil fuel was in the High level with the same average of 4.12, followed by to solve the global warming problem was in the High level with the average of 4.07.

Post Purchase Behavior Aspect You intend to have your family members using the electric vehicles was in the High level with the average of 4.06, followed by will use the electric vehicles instead of fuel vehicles was in the High level with the average of 4.02, and will recommend people you know to use the electric vehicles was in the High level with the average of 3.91, respectively.

Table 4 Data Analysis Using Multiple Regression Analysis Factors Affecting the Decision to Buy Battery Electric Vehicles of Consumers in Bangkok and Metropolitan Area

Independent Variables (Considering in Each Aspect)	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Constant	.947	.274		3.456	.001
Marketing Mix Factors:					
Product	.169	.068	.120	2.483	.013*
Price	.061	.061	.061	1.008	.314
Distribution Channels	-.044	.056	-.062	-.782	.435
Marketing Promotion	.089	.052	.124	1.705	.089
Technology Acceptance:					
Perceived Usefulness	.023	.057	.021	.400	.689
Perceived Ease of Use	-.011	.029	-.017	-.374	.708
Intention to Use	.195	.049	.228	3.960	.000**
Perceived Risk	-.020	.043	-.023	-.473	.636
Attitude Toward Using	.153	.056	.164	2.722	.007**
Actual Use	.158	.051	.184	3.089	.002**

F = 26.097, R = .5628, R² = .394, Adjusted R² = .379

* Statistical Significant at 0.05 level

** Statistical Significant at 0.01 level

In Table 4, it reveals that the result of Multiple Regression Analysis for the marketing mix factor in the aspect of product and the technology acceptance factors in the aspect of intention to use, attitude toward using and actual use could anticipate or influence the decision to buy battery electric vehicles of consumers in Bangkok and Metropolitan Area with statistical significance at 0.05 level for 39.4%.

Discussion

1. The marketing mix factors affecting the decision to buy battery electric vehicles in overall was in the High level with the average of 4.20 and the standard deviation of 0.707. This reveals that in overall the samples had opinions in the same direction or similar or exactly the same due to the small data distribution as the standard deviation is less than 1. In consideration to each aspect, it was found that the marketing mix factor in the aspect of product was in the Highest level in the top range with the average of 4.49 and the standard deviation of 0.537, by which the aspect with the most precedence was the After Sale Guarantee such as battery and electric system guarantee. It reflected that consumers considered the marketing mix factor in the aspect of product such as the after sale guarantee for making a decision to buy battery electric vehicles because consumers had confidence and trusted the use of battery electric vehicles in the long term including the better services they would get, it thus affected the decision to buy battery electric vehicles. This is corresponding to the research of Bunjongmanee (n.d.), which found that consumers gave precedence to the marketing mix factor in the aspect of product that affected to the decision to buy the hybrid vehicles of consumers in the first place, followed by the reliability of services affected the decision to buy the hybrid vehicles of consumers with the statistical significance at 0.05 level.

2. The Technology Acceptance factors affecting the decision to buy battery electric vehicles in overall was in the High level with the average of 4.15 and the standard deviation of 0.665. It reveals that in overall the samples had opinions in the same direction or similar or exactly the same due to the small data distribution as the standard



deviation is less than 1. In consideration to each aspect, it was found that the Technology Acceptance in the aspect of Perceived Usefulness was in the Highest level in the top range with the average of 4.33 and the standard deviation of 0.683, by which the aspect with the most precedence was electric vehicles are innovation (technology) that consumes alternative energies for the sake of reducing global warming. Such findings revealed that before consumers making the decision to buy, the perception was significant as it was a key part of consumer for making the decision to buy a product. Thus any product that can create good perception, will lead to consumers' acceptance on itself. Therefore, the technology acceptance in the perception aspect for the electric vehicle benefits to lessen the global warming, will affect the decision to buy battery electric vehicles. This is corresponding to the findings of Pakdeesuk (2018) who found that the technology acceptance factor perceiving the use of electric vehicle contributing to the reduction of global warming got the highest opinion. Moreover, it was also found that the factors of attitude, marketing mix and technology acceptance affected or influenced the decision to buy electric vehicles of consumers in Bangkok and Metropolitan Area with the statistical significance at 0.05 level.

3. The decision to buy battery electric vehicles in overall had the average opinion in the High level for 4.14 and the standard deviation of 0.754, which reveals that in overall the samples had opinions in the same direction or similar or exactly the same due to the small data distribution as the standard deviation is less than 1. In consideration to each aspect, it was found that the decision to buy battery electric vehicles in the evaluation of alternatives aspect was in the Highest level with the average of 4.32 and the standard deviation of 0.835. The aspect with the most precedence was the reliability of the automobile or vehicle makes was the data for marketing strategy planning relating to product make value on the reliability and reputation maintaining to have impact on the buying decision process and consumer satisfactory creation. Such finding also reveals that any product make with good perception creation will lead consumers to accept the product make reputation and to rely on such product make. In any case, before consumers make decisions to buy products, the perception is vital since it is part of decision making of consumers to buy products. Thus, the creation of product brand perception on the reliability of vehicles make will certainly lead to the decision to buy battery electric vehicles. This is corresponding to the findings of Vongkittiwat (2017) who found that consumers in working ages gave precedence to the product make value that electric vehicles had quality certification marks which made the confidence to buy to come on the top range and according to Samerjai (2006) who stated that consumers were willing to pay their money to the well-known product brand which were able to make satisfaction and psychological worthiness.

4. The factors affecting the decision to buy battery electric vehicles of consumers in Bangkok and Metropolitan Area were namely the factor of marketing mix on product aspect, and technology acceptance on aspect of intention to use, attitude toward using and actual use with the statistical significant at 0.05 level, which enabled the anticipation or influence on the decision to buy battery electric vehicles for 39.4 percent. The results of this study showed that the samples gave precedence to the marketing mix factor on product aspect namely after sale guarantee such as the 8 year battery guarantee for electric vehicles or 160,000 km. and 5 year electric system guarantee or 100,000 km., including the property of electric vehicles as environmental friendly; not generate dust to cause air pollution, and reputation of electric vehicle makes influenced the decision to buy electric vehicles, and lastly electric vehicle had uniqueness for its noiseless engine (Silence) influenced the decision to buy battery electric vehicles with the opinions in the Highest level. Such findings confirms the marketing mix concept of Kotler & Keller (2009) that it can be used in the current context. That is to say, the marketing mix is a set of marketing tools used by organizations to achieve their marketing goals which affect the buying decision process and fulfil



consumers' satisfaction. Nevertheless, certain features of some products that may affect buying behaviors of consumers are being a brand new product, complexity, and perceived quality of the product so the decision to buy requires to be deliberately made. For that reason, consumers are likely to use the marketing mix factor on product aspect since it helps them having confidence and reliability on using the vehicles in the long term. Furthermore, the better services for consumers trend to affect the decision to buy battery electric vehicles. Likewise, Samerjai (2006) mentioned that consumers were more willing to pay for the famous brand and globally well-known product than the unknown ones since they trust such brand to better fulfil their satisfaction and give them more mental worthiness than no else product can make. It is corresponding to other research findings showing that the marketing mix influenced the decision to buy battery electric vehicle (Vongkittiwat, 2017; Pakdeesuk, 2018; Bunjongmanee, n.d.).

Whereas the technology acceptance factors on the aspects of intention to use, attitude toward using and actual use affected or influenced the decision to buy battery electric vehicles of consumers in Bangkok and Metropolitan Area with the statistical significant at 0.05 level. The findings revealed the confirmation on the technology acceptance concept of Davis, Bagozzi, & Warshaw (1989) that it can be used in the current context, that is to say technology acceptance is to understand the technology and decision making to accept the technology and apply it in daily life. This is corresponding to other research findings which found that technology acceptance and online consumer behavior influenced the decision to buy E books of consumers in Bangkok and Metropolitan Area with the statistical significant at 0.05 level. The technology acceptance consists of the ease of use, Intention to use, and actual use and the online consumer behavior consists of online perception, online entertainment, and attitude towards online media (Laeieddeenun, 2016) and attitude towards the use was the influencing factor for the interest of using technology to enhance quality of life it was also used as the influencing variable for the trend of intention for online shopping services of the baby boomer groups (Pan & Jordan-Marsh, 2010).

Conclusion and Suggestions

It can be concluded from the research as follows;

1. The factors of the marketing mix affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area were found overall at a high level.
2. The factors of technology acceptance affecting the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area were found overall at a high level.
3. The consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area were found overall at a high level.
4. The analysis of the factors the affecting consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area revealed that product aspect, technology acceptance in intention to use, attitude toward using and actual use all influenced the consumers' decision to buy battery electric vehicles in Bangkok and Metropolitan Area at the statistically significant at 0.05 level.
5. Suggestions from the Research

5.1 According to the research findings, it was found that the marketing mix factor on product aspect influenced the decision to buy battery electric vehicles through the precedence given on the after sale services like the 8-year battery guarantee for electric vehicles or 160,000 km. and 5-year electric system guarantee or 100,000 km. in the highest level. Therefore, the entrepreneurs concerning the electric vehicle business should



prepare product marketing plans by considering the after sale services as the key factor to persuade or motivate consumers to make their decisions to buy more battery electric vehicles since they have more confidence on the prospect products to be used in the long term, that it will be long lasting as years passed by. For the consumers' shopping behavior in the digital era, customers always buy more for the products they experienced in their former shopping. Good after sale services will gain trust from customers and it is likely that they will buy the products again from the same brand of make or sale assistance. It was found that about 70% of buying experience outcomes depends on how customers were being treated. Therefore, the fundamental after sale services is the key to the sale since they contribute to the repeat buying of customers. Due to the confidence and reliability on buying products or services from the companies, there will be no problem in the future or if any then it will be suddenly and completely solved (Guest Author, 2015).

5.2 The entrepreneurs concerning the electric vehicle business should have customer assistance program in emergency case which is a good after sale service with the ready to serve in emergency event such as 24 hours service using technology for basic problem identification via an application (Choobanchong, 2014). Moreover, there should be an information facilitation via the community website like www.wongnai.com for the group of electric vehicle users to upload and share photos of electric charging stations and places for changing electric vehicle batteries (Ketwadee Marumura, n.d.). According to the survey result of "Global Digital 2019" that gathered data worldwide, it was found that 51 millions of Thai people always use Social Media; 49 people use social media on mobile phones, it reflects that Thai people have behavior and are already familiar in using social media (WP, 2019).

5.3 The entrepreneurs concerning the electric vehicle business and public entrepreneurs such as Metropolitan Electricity Authority, Provincial Electricity Authority, Electricity Generating Authority of Thailand and PTT Public Company Limited etc. should give precedence to the factors influencing the decision to buy battery electric vehicles of consumers consisting of the marketing mix factor on product aspect and the technology acceptance factors on the aspects of intention to use, attitude toward using and actual use. They can be used in marketing communication planning since such factors are significant to stimulate the acceptance and the decision to buy battery electric vehicles to create the perception and confidence in the efficiency of the products since the perceptions is part of consideration of consumers to make decision to buy product for their future usage. Moreover, they should expand their business to widen their business chances and for facilitation such as operating electric charging stations and distribution of devices for standard electric charging to make the comprehensive functional usages and to support for the growth of the electric vehicles (Khantachavana, 2019).

6. Suggestions for Future Research

6.1 This research was a study with the samples living in Bangkok and Metropolitan Area only. Therefore, the future research should study with samples in other regions in countrywide in order to represent the study of national level. For the purpose that in the future if all automobile systems are replaced by the electric vehicles, the finding of such research can be used to develop the logistic system and promote electric vehicles in Thailand.

6.2 Since Thai automobile industry is likely to transform along with the trend of environmental friendly to significantly contribute the reduction of global warming, the future research should study other new factors affecting the decision to buy battery electric vehicles for the benefits of marketing planning and creating chances for new businesses with environmental care. This includes the management of deteriorated Lithium Battery to be recycled as the Second-Life battery for Electricity Storage, which has no adversary effects to environment and old



vehicle modification to transform into the electric vehicles as an alternative for Thai people to be able to access and afford the electric vehicles, and so on.

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