

## MALAYSIAN PERCEPTION AND ATTITUDE TOWARDS ELECTRIC VEHICLE

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### ABSTRACT

It is noticeable that environmental problems are now becoming global issue. Automotive industries are one of the major contributors to environmental problems. Harmful gases released and waste of automobile polluted the quality of air and damaging the environment. Because of excessive consumption of fossil fuels leads to greenhouse gases emission and causing various environmental problems. Since Malaysia's automotive production increasing rapidly compared to other Asian countries. Therefore, there is a pressing need to examine Malaysian vehicle users' level of intention, major factors to influence to buy and barriers for green technology. Hence, the aim of this research paper is to investigate vehicle users' level of intention, major influencing factors and obstacles to purchase green car in Malaysia. The findings of this study indicate that there is a significant relationship between age group, education and attitudes towards EVs. It also revealed that the significant relationship between purchase intention and demographic variables such as age group, education and gender. Therefore, the results from this study can be used to provide important insights for policy-makers in developing programs or projects to increase consumers' awareness, removing obstacles and focus on major influential factors for having environment friendly automotive industries in Malaysia.

**Keywords-** Attitudes, Purchase intention, Electric vehicles (EVs), User, Malaysia

## 1. INTRODUCTION

Carbon dioxide (CO<sub>2</sub>) is one of the major contributors of global warming. It has been noticed that the greenhouse gas

emissions are rapidly increasing in both developed and developing countries. Therefore, the aim of decreasing GHG discharges must be implemented by developing and developed countries alike. Obviously, transport system will be among the first issues that need to be re-addressed as two-thirds of the emissions come from fuel combustion in the sector. As more than 80% of vehicles are still running with petrol fuels, it is a challenge for Malaysia to reduce energy intensity especially in terms of petroleum fuels used in the sector. In view of the predicted increase in the energy use in transport and the limited oil resources, it is a national priority to move the transport sector towards greater diversification in fuel use and implement energy efficiency measures that focuses on road transportation. This paper will analyze the consumer attitudes and perception to understand the key issues and challenges faced for sustainable transportation in Malaysia. The paper will also discuss the policy and strategic options aimed towards energy efficient pathways. Therefore, the results from this study can be used to provide important insights for policy-makers in developing programs or projects to increase consumers' awareness, removing obstacles and focus on major influential factors for having environment friendly automotive industries in Malaysia.

## 2. Methodology

### 2.1 Survey design and sampling methods

The questionnaire used in this study was based on a survey among car users in Kuala-Lumpur city; Malaysia. The study was employed direct face-to-face interviews in this study because this has been shown to be the most reliable approach (Carson, Flores et al. 1996). The survey was conducted in August, 2012. A random sample was taken in the residential areas in Kuala Lumpur such as Selayang, Cheras, Ampang, Taman Jaya and Kuala Lumpur. A total of 385 responses were received and used for subsequent analysis.

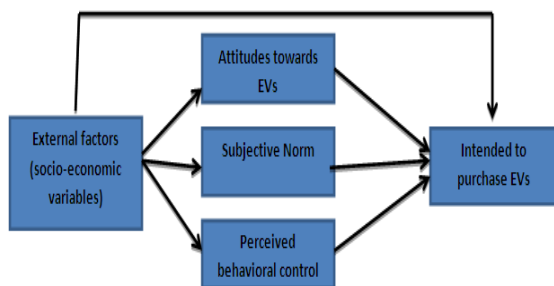
### 2.2 Design of the questionnaire

The questionnaire was developed following the literatures on environmental behavior and previous application of TPB such as (Ajzen 1991) and (Tonglet, Phillips et al. 2004). The questionnaire had three sections. The first section collected information on the respondents' socio-economic characteristics such as gender, age, race, education, income and so forth. The second section included several items to measure the respondents' attitudes towards EVs, subjective norm, perceived behavioral control and purchase intention towards EVs. The last section contains several questions that ask the respondents to rank the environmental vehicles, their interest and decision for EVs.

### 3.1 Conceptual framework

The Theory of Planned Behavior was developed in response to a related existing model—The Theory of Reasoned Action (TRA) (Ajzen, 1988, 1991). Briefly, the Theory of Reasoned Action (Fishbein&Ajzen, 1975; Ajzen&Fishbein, 1980) places intention as the principal predictor of behavior. So conceived, the more one intends to engage in behavior, the more likely is the occurrence of the behavior. Determining intention are attitude and subjective norm. The attitudinal determinant of intention is defined as the overall evaluation of behavior. This overall evaluation, in turn, is composed of the salient beliefs: the perceived likelihood of particular consequences of the

behavior occurring, weighted by an evaluation of the consequences. The subjective norm determinant of attitude is conceptualized as social pressure from significant others to perform or not perform the behavior. The subjective norm, in turn, is composed of normative beliefs: the perceived pressure from salient referents, weighted by the motivation to comply with the referents. The TRA has received support across a range of contexts (Sheppard et al., 1988). A recognized limitation of the TRA is that it was developed to deal with behaviors that are completely under an individual's volitional control (Ajzen, 1988; Fishbein, 1993). Figure 1 shows the conceptual framework of this study.



Source: Ajzen (2002) Theory of Planned Behavior (TPB)

Figure 1: Conceptual framework of TPB with application of consumers' attitudes towards EVs in Malaysia.

### 3.2 Variables used in the model

A statistical analysis was employed to analyze the socio-economic factors which influence individual's attitudes, subjective norm and perceived behavioral control towards intended behavior to purchase EVs. The following socio-economic variables such as gender, age, education, occupation, race, income, subjective norm, perceived behavioral control and attitudes towards EVs were used as independent variables whereas, purchase intention (PIN) towards EVs of the respondents to combat environmental issues and challenges was considered as the dependent variable. Finally, multiple regressions were run to see the relationship between demographic factors as independent variables and PIN, PCB, ATT and SN considering them as dependent variables. Table 1 presents the independent variables which were used in the regression models.

Table 1. Independent variables in the regression models

Variables	Description of the Variables	Category
Gender	Male, female	1=Male, 0= Female
Age	Age	1=18-30 years, 2=31-45 years, 3=46-60 years, 4=61 and above
Race		1=Malay, 2=Chines, 3=Indian, 4=Others
Education	Educational Status	1= Secondary, 2=Higher secondary, 3=Diploma, 4=Bachelor, 5=Postgraduate
Income	Monthly family income	1=RM 2000 and less, 2=RM2001-4000, 3=RM4000-6000

		4=RM6000-8000, 5=RM 8001 and above
Attitudes towards EVs	5 items	1= Strongly Disagree, 2= Disagree, 3=Somewhat agree, 4= Agree, 5= Stringly Agree (Likert scale)
Subjective Norm	5 items	1= Strongly Disagree, 2= Disagree, 3=Somewhat agree, 4= Agree, 5= Stringly Agree (Likert scale)
Perceived behavioral control	4 items	1= Strongly Disagree, 2= Disagree, 3=Somewhat agree, 4= Agree, 5= Stringly Agree (Likert scale)
Purchase Intention	6 items	1= Strongly Disagree, 2= Disagree, 3=Somewhat agree, 4= Agree, 5= Stringly Agree (Likert scale)

## 4. Results and discussion:

### 4.1 Descriptive statistical analysis

We had successfully distributed 400 questionnaires among those car owners and collected a total of 385 complete questionnaires out of 400. It shows that the response rate was 96%. Table 1 shows that male was 50.9% while female 49.1%. It also shows the age distribution of respondents in the study area. The age of respondents ranges between 18 and over 60 years. The greatest number of respondents (47.5%) was from the age group between 31 years and 45 years. Most of the respondents are middle aged. The second largest group of respondents (40%) was between 18 years and 30 years. The largest number of the respondents was Malay (61%) as shown in table 1. The finding shows the educational status of the respondents. It is reported that 22.1% had graduate education, while 21.8%, 21.6%, 19% and 5.7% had diploma, lower secondary, higher secondary and postgraduate education, respectively. In this study we found that only 8.6% of the respondents had an income range of RM 2000 and less than RM 2000. The highest percentage of the respondents (40.5%) had an income range of RM2000 up to RM4000 per month. While 39%, 7.3%, of the respondents had an income range of RM4000 up to RM6000, and RM6000 up to RM8000 respectively. There were only 4.7% respondents with an income range of more than RM 8000 per month. According to the Department of Statistics Malaysia, more than half of the Malaysian households earn a monthly income of less than RM3000. The remaining of the households earn between RM3001 and RM4000 (12.9%), RM4001 and RM5000 (8.6%), RM 5,001 and RM 10,000 (15.8%), and above RM 10,000 (4.9%) (DOSM, 2009).

### 4.2 Consumers' knowledge, awareness and interest towards EV

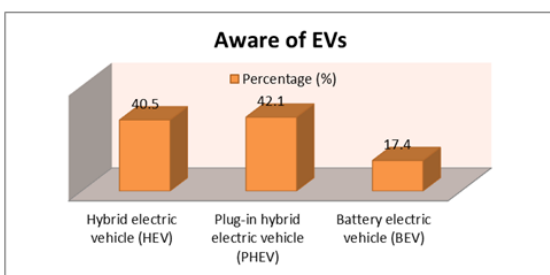
Table 2 indicates that only 19.2% of the respondents are known the term sustainability while 80.8% not aware. It reflects that consumers' knowledge on environmental issues is very low. "Consumers' environmental knowledge" is obtained as the key pointer in the "green customers' purchasing model"

(Young, Hwang et al. 2010). According to Heffner et al., 2007 found that those who have high level of environmental awareness indicating high level of interest towards EVs. It is obvious that knowledge of environmental issues have direct impact on one's intention is to use environmental friendly cars. According to (Laroche, Bergeron et al. 2001), an individual's knowledge about the environment also plays an important role in influencing the pro-environmental behavior. Table 2 also shows that 75.3 of the respondents are influenced to purchase environmental friendly cars by knowing of environmental issues. It could be assumed that an individual's attitude towards the importance of Ecological problems generally may influence the willingness to purchase environmentally friendly products (Cheah and Phau 2011).

**Table 2: Familiar with sustainability and influenced by it**

Items	Frequency	Percentage (%)
Sustainability		
Yes	74	19.2
No	311	80.8
Influence		
Yes	290	75.3
No	95	24.7
Total	385	100

It is noticeable that Malaysian car owners are aware of environmental friendly cars. This study found that highest number of consumers (42.1%) is familiar with plug in hybrid electric vehicles (PHEV) while 40.5% and 17% of the consumers familiar with hybrid electric vehicles (HEV) and battery electric vehicles respectively ( Figure 2). This is opposite of the past study as according to (Heffner, Kurani et al. 2007) found that, the consumers who have high levels of environmental awareness, choosing a HEV represents notions associated to one's personality and is used to interconnect interests and values. Studying HEV purchases in Los Angeles County, (Kahn 2007) found that environmentalists are more likely to purchase HEVs compared to non-environmentalists. Likewise, (Gallagher and Muehlegger 2011) found that social preferences for environmental quality and energy security were a major determinant for consumer adoption of HEVs. Gallagher and Muehlegger concluded that social preferences increased HEV sales more than rising gas prices or tax incentives. Therefore, it can be concluded that Malaysian car owners are not environmentalists.

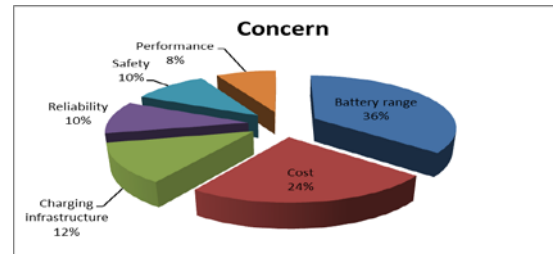


Source: Field survey 2012

**Figure 2. Awareness of environmental friendly cars**

Source: Field survey 2012

Figure 3 indicates consumers concern associated with EVs. It presents that 53.8% of the respondents mentioned battery range is the highest problem followed by high cost (23.6%) while 12.2%, 10.1%, 10.1%, 8.1% of respondents concern about changing infrastructure, reliability, safety and Performance. These concerns reaffirm some of the issues identified initially by respondents when asked about associations with EVs.



Source: Field survey 2012

**Figure 3. Concern about electric vehicles (EVs)**

In this study, authors discussed the ranking of electronic vehicle attributes as shown Table 3. It indicates that Malaysian car owners assign ranked 1 to "Design of the car" while ranked 2, 3, 4 and 5 for safety, quality, reduce greenhouse gas emission and performance respectively. It means Malaysian car owners are more concern about "Design of the car". It also shows that they assigned rank 5 to "Reduced greenhouse gas emission". This result indicates that Malaysian car owners are not aware of greenhouse effects on environment. In this regard policy makers in government and other social organization should work together to create awareness among them.

**Table 3. Ranking of electronic vehicle attributes**

Items	Mean (N=385)	Std.Dev(N=385)	Ranking
<i>Performance</i>	2.8421	1.07778	4
<i>Safety</i>	2.3584	1.08797	2
<i>Design</i>	2.1870	1.08318	1
<i>Quality</i>	2.4312	1.12549	3
<i>Reduced greenhouse gas</i>	3.012	1.09823	5

Source: Field survey 2012

In this study the researchers also showed the relationship between demographic and components of well-known theory of planned behavior (TPB) as shown in Table 4.

**Table 4. Demographic factors affect subjective norm (SN), attitude (ATT), perceived control behavioral (PCB) and purchase intention (PIN)**

Variables	Coefficients	Std. Error	t	Sig
(Constant)	2.518	.285	8.844	.000
Male Female	.067	.087	1.273	.204
Age Group	.106	.070	1.888	.060
Race	-.048	.066	-.843	.400
Education	.053	.035	.828	.408
Income	.004	.050	.076	.939
Dependent Variable: SN				
(Constant)	2.383	.254	9.377	.000
Male Female	.016	.078	.301	.764
Age Group	.152	.062	2.733	.007
Race	.008	.059	.149	.882
Education	.194	.031	3.064	.002
Income	-.040	.045	-.718	.473
Dependent Variable: ATT				
(Constant)	2.672	.247	10.798	.000
Male Female	.077	.076	1.466	.143
Age Group	.007	.060	.117	.907
Race	-.052	.057	-.902	.368
Education	.002	.030	.025	.980
Income	-.049	.044	-.870	.385
Dependent Variable: PCB				
(Constant)	2.090	.360		.000
Male Female	-.107	.110	5.799	.028
Age Group	.102	.088	-2.200	.050
Race	.037	.083	1.967	.480
Education	.396	.044	.707	.000
Income	-.031	.064	6.678	.549
Dependent Variable: PIN				

The results revealed that there is a significant relationship between age group, education and attitudes towards EVs. This is because young generation is more concern about environmental issues and similarly, educated people are more aware of EVs and negative consequences of conventional vehicles. It also revealed that the significant relationship between purchase intention and demographic variables such as age group, education and gender.

## Conclusion

With its rapid industrialization, Malaysia is becoming more and more dependent on conventional energy sources such as fossil fuels. The growing use of energy over the years which seriously depend on fossil fuels has subsequently increased greenhouse gas emissions, primarily of CO<sub>2</sub> from the transport sector. In view of the predicted increase in the energy use in transport and the limited oil resources, it is a national priority to move the transport sector towards greater diversification in fuel use and implement energy efficiency measures that focuses on road transportation. The finding of this study indicates that only 19.2% of the respondents are known the term sustainability while 80.8% not aware. It reflects that consumers' knowledge on environmental issues is very low. It also shows that 75.3 of the respondents are influenced to purchase environmental friendly cars by knowing of environmental issues. It is noticeable that Malaysian vehicles

users are aware of environmental friendly cars. This study found that highest number of consumers (42.1%) is familiar with plug in hybrid electric vehicles (PHEV) while 40.5% and 17% of the consumers familiar with hybrid electric vehicles (HEV) and battery electric vehicles respectively. Chi-square analysis also exhibited that there were significant differences in former familiarities with AVFs. The reasons might be that highly educated people are more concern about AVFs than lower one and those who are highly educated will earn more than lower one. Consequently, different level of education and income has significant difference among them.

The results exposed that there is a significant relationship between age group, education and attitudes towards EVs. This is because young generation is more concern about environmental issues and similarly, educated people are more aware of EVs and negative consequences of conventional vehicles. It also revealed that the significant relationship between purchase intention and demographic variables such as age group, education and gender. Therefore, the results from this study can be used to provide important insights for policy-makers in developing programs or projects to increase users' awareness, removing obstacles and focus on major influential factors for having environment friendly automotive industries in Malaysia.

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