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## A new era of sustainable transport: An experimental examination on forecasting adoption behavior of EVs among Malaysian consumer



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### ABSTRACT

The new global era of economy faced obstacle due to carbon emission. The main reason behind this intensification of crises is caused by the transportation sector, as million petroleum based vehicle are waging on the street day and day which initiated carbon emission. The Malaysian government also faced major problem due to this CO<sub>2</sub> emission. Because Malaysia is considered as major energy efficient nation. With the aim of obstructing these susceptibilities and endorse a more sustainable economy, the main solution is to change from Petroleum-based vehicles by using green vehicle innovation. Using, Electric Vehicles (EVs) have the probable to lessen the carbon emission, gasoline consumption in order to alleviate the environmental problem. Subsequently, the idea of this paper is to scrutinize whether attitudes (ATT) towards EV adoption by integrating three dimensions of attitude along with the theory of planned behavior the study suggests an assimilated model. A sample of 391 respondent has been collected from Malaysia in order to forecast the customer's purchase intention to adopt EV by using the extended theory of planned behavior. The empirical outcome by using PLS investigation exposed the three dimension of attitude have a significant effect to build attitude. Finally, the finding of this survey questionnaire is analyzed by using Smart PLS to perform CFA and SEM. The outcome of this research specifies that ecological significance and individual preference.

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## 1. Introduction

The world is going through crucial issues like energy scarcity, air pollution, and emission of greenhouse gas (GHG) (Sang and Bekhet, 2015). Electric Vehicles, which use both electrical and internal combustion engines for propulsion purposes, appear to be a very promising prospect (Sang and Bekhet, 2015). Moreover, EVs are presently emerging as an answer for the issue of reliance on traditional fuels, emissions of growing CO<sub>2</sub>, as well as other eco-friendly concerns (Adnan et al., 2016a). Hence, this sort of vehicle offers an advantage in the quest to reduce carbon emissions by as much as 30 percent to 50 percent, and be able to attain 40 percent to 60 percent improvement in fuel efficiency (Church, 2015; Parshall et al., 2010) mentioned that these figures are provided by the manufacturers. Though, Bonges and Lusk (2016) stated that

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### Nomenclature

GHG	greenhouse gas
EVs	electric vehicles
HEVs	hybrid electric vehicles
PHEVs	plug-in hybrid electric vehicles
BEVs	battery electric vehicles
AFVs	alternative fuel vehicles
ICEVs	internal combustion engine vehicles
AEVs	all-electric vehicles
HEVs	hybrid electric vehicles
TRA	Theory of Reasoned Action
TPB	theory of planned behavior
DOI	diffusion of innovation
PBC	perceived behavioral control
SN	subjective norm
ITR	interaction
KS	knowledge sharing
RES	response

in actual fact, they are going to be somewhat on the lower side. Several researchers have proved that a great amount of reduction in greenhouse gas emissions and the increasing dependence on oil could be accomplished by the electrification of the transport sector which further needs proper understanding and adoption from the consumer's point of view (Barbarossa et al., 2015). Certainly, the emergence of Hybrid Electric Vehicles (HEVs) has received substantial industrial accomplishment starting from the last decade. However, all the vehicles are categorized into 3 major groups, such as Internal Combustion Engine Vehicles (ICEVs), Hybrid Electric Vehicles (HEVs), and All-Electric Vehicles (AEVs) (Adnan et al., 2016a; Boroojeni et al., 2017). Moreover, the very recently introduced Plug-in hybrid electric vehicles, PHEVs, have the potential to improve the total fuel efficiency. Nonetheless, Rahman et al. (2016) specified that an EV has less CO<sub>2</sub> emission and its helps towards environmental sustainability. Nevertheless, Schuitema et al. (2013) argued that the disadvantage of EV batteries is that they cannot offer the same mileage that a pure EVs would offer as batteries are easily drained off for PHEVs. Furthermore, Hosseini et al. (2012) claimed that there are very few plug-in facilities that such vehicles may require. Rezvani et al. (2015) highlighted that the EV is the combination of a gasoline or diesel engine with an electric motor and it also carries a large rechargeable battery. Khooban et al. (2016) emphasized that since they use less gas, they also cost less to fuel: driving a PHEV can save hundreds of dollars a year in gasoline and diesel costs and helps to save the environmental sustainability. In order to gain the main goal of this study, there is a need to resolve the shortcomings, i.e., limited mileage offered by the batteries as well as the inability to charge the batteries with the frequency required, that have hindered the acceptability of EVs (Sang and Bekhet, 2015). However, Johansson and Mattsson (2012) suggested that the adoption of electric vehicles is gaining popularity and increasing acceptability. Because of EVs being more practicable, they are becoming more popular in the developed nations, such as the U.S., Japan, and Europe (Fotouhi et al., 2016). However, in the context of the developing countries likewise, such as in Malaysia where the government has noted the advantages offered by EVs and has taken measures to promote its use (Luo et al., 2012).

The Malaysian higher authority had fixed the goal of 500,000 EVs being driven on Malaysian roads at the end of 2015 and around five million by the year 2020 (The National Council of Malaysia, 2012). In order to promote the usage of PHEVs/EVs, the government has initiated a number of policies, including subsidizing the sale of EVs. The government has also paid special consideration to the advancement and manufacture of EVs in the eleventh 5 yearlong Plan. The government has also planned to invest RMB 100 billion (\$ 16 billion) for the improvement of technologies in the 25 year long planning (Sang and Bekhet, 2015; Zhang et al., 2011). The government did indicate in 2009 a 10 cities-thousand Vehicles initiative to give a boost to the growth of EVs and to popularize their use. However, the consumer reaction fell short of expectations (Sang and Bekhet, 2015). According to the Malaysian Automobile Manufacturers Associations, the cumulative sales were 27,400 EVs in 2012. Of these, 23,000 were acquired by the governing agency and the community service sector whilst 4400 were bought by individuals. It was seen that the ordinary Malaysian considered the performance of the conventional vehicle to be superior to the EV (Zhang et al., 2013). The consumer did, however, show his/her preference to have an EV as a second vehicle (Sang and Bekhet, 2015). Currently, it is estimated that 13% of households have a second car. Likewise, Zhang et al. in (2013) illustrate that the EV technology may also improve and consumers may prefer the new innovations, In any case, there are bright prospects of EVs gaining popularity in Malaysia.

The penetration of electric vehicles into the market of Malaysia has directed the vehicular industry to an entirely new dimension which is based on less dependency on fuel and improved fuel efficiency (Rezvani et al., 2015). Though Adnan et al. (2016a,b) declared that electric vehicles may decrease the overall tailpipe emission, the benefits in the context of entire emission are slightly marginal if the traditional power generation still uses coal as a primary source. So, the governing agency

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