

Consumer Motivation to Enhance Purchase Intention Towards Electric Vehicles in Malaysia

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Abstract. Transportation is extremely important in contributing to the life quality development of urban areas. However, it has influenced negatively on individuals and the environment due to carbon emissions and gases. Worldwide, organizations and countries are exploring a solution and have developed Electric Vehicles (EVs) as the best possible solution. Electric vehicles emit no exhaust emissions and are powered by batteries. The adoption rate of EVs in rich countries is increasing year after year, while consumer adoption intention of EVs in poor countries is quite low, particularly in Malaysia. The ownership percentage of Internal Combustion Engine Vehicles (ICEs) in Malaysia is 93 percent, placing it near the top of the globe, but EV adoption is just about 3.5 percent. Consumer awareness of EVs is quite low, which is why consumer adoption intentions toward EVs are not increasing. Malaysia is the world's 26th highest emitter of carbon and greenhouse gases (GHG). This study will assist in identifying the characteristics that can maximize consumer interest in EVs and will be beneficial to the government and industry in developing the market as stated in the Paris accord and achieving the Carbon Neutral Nation 2050 aim. The study will go through the motivators that lead consumers to purchase EVs. These characteristics will provide transportation sectors insights on bridging the demand and supply of sustainable vehicles.

1. Introduction

Sustainable Development Goals (SDGs) in United Nations 2030 agenda has gained significant attention among academics and policy-makers to deliver numerous benefits for the health, environment, and economy, especially in urban areas where more than two-thirds of the population will live by 2050 (DESA, 2018). In September 2019, UN Secretary-General Ban Ki-moon urged all sectors of society to step up efforts to address global issues like climate change, poverty, and inequality (UN, 2020). Overpopulation, climate change, inadequate infrastructure and resources, harsh weather, linked sickness, air pollution, and loss of productivity are problems experienced by many countries across the world (J. Salmond, Sabel, & Vardoulakis, 2018; J. A. Salmond et al., 2016; Vardoulakis & Kinney, 2019), where Greenhouse Gases (GHG) are significant source of climate change (Farooqi et al., 2020). Promoting the SDGs as a means of addressing environmental health threats, such as climate change (Goal 13), which should be enhanced to promote wellbeing and good

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health. The development of nations worldwide is contingent upon their transportation infrastructure (Adler, 1987). Transportation, whether in urban or rural, makes a significant contribution to the enhancement of one's quality of life (Moore, 2013). GHG released from the fossil fuels comprises mainly on carbon dioxide (Co₂) and methane, which are significant contributor towards global warming (Farooqi et al., 2021). Numerous countries worldwide have faced these combined challenges: population growth, climate change, insufficient infrastructure and resources, harsh weather, associated sickness, air pollution, and loss of productivity (J. Salmond et al., 2018; J. A. Salmond et al., 2016; Vardoulakis & Kinney, 2019). Promoting the SDGs for tackling environmental health threats, such as climate change (Goal 13) and carbon emissions reduction, which should be prioritized for human well-being and health (Goal 3), instantly (Howden-Chapman, Keall, Whitwell, & Chapman, 2020). Well-planned sustainable modes of transport, renewable energy, land use, and waste management all have the potential to improve the environment's, as well as human and animal, quality of life and health (Vardoulakis & Kinney, 2019).

Efficient transportation infrastructure is necessary for communities to thrive and residents to have a stable source of income, and a well-organized transportation system contributes significantly to environmental and economic growth (Browne & Ryan, 2011). The transportation sector undoubtedly has a negative impact on the environment as a result of many gas emissions such as CO₂, NO_x, and others. The energy consumed by the transportation sector results in a complete reliance on petroleum (Turcksin et al., 2011). Because the use of Internal Combustion Engine (ICE) vehicles results in the emission of a variety of gases, governments worldwide are more concerned with preventing the use of ICE vehicles through the implementation of severe rules (Santos, Behrendt, & Teytelboym, 2010). Globally, governments are more concerned with transitioning to sustainable modes of transport (Qureshi & Lu, 2007). António Guterres, Secretary-General of the United Nations, calls on all countries to adhere to strict laws and measures for achieving net-zero carbon emissions by 2050 (UNFCCC, 2019). This is feasible through the adoption of sustainable transport, which is defined as innovation in the transportation industry that results in sustainable progress and minimal carbon emissions. Electric Vehicles (EVs), which include Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), Battery Electric Vehicles (BEVs), and Fuel Cell Vehicles (FCVs), are the primary mode of sustainable transportation.

Malaysia is the world's 25th highest emitter of greenhouse gases (GHGs), and the transport industry is the country's second-largest source of carbon emissions (Star, 2019). Globally, Malaysia has the third leading combustion engine vehicle ownership ratio with 93% (Malaysiakini, 2014), and the transport sector uses about 35% of the country's total production output. Consistent urbanization, economic development, and rising income have resulted in a rapid increase in car ownership; yet, air pollution and environmental risks associated with GHG emissions remain the primary source of worry (Shariff, 2012). Malaysia has also committed to reducing GHG emissions by 2030 in its Greentech Master Plan (KeTTHA, 2017), and transportation is Malaysia's second-largest source of carbon emissions. Simply introducing sustainable automobiles is insufficient until they gain consumer acceptance and support. Acceptability of novel technologies requires financial and educational support, as well as consumer acceptance, especially emerging countries such as Malaysia (Karp, 2016). If consumers lack the desire to acquire EVs, production alone will not suffice. Despite their environmental benefits, electric vehicles have very little market share. While there are still considerable obstacles to the easy uptake of EVs in Malaysia, the purchase of EVs can be boosted by prospective consumer supply and demand-side support. Effective retail tactics should be implemented by EV automakers in order to increase EV adoption. Financing the manufacture of EVs needs a large capital investment, which can

affect the final price. Governments should encourage local professionals to develop technologies that can be subsidized to make the product more accessible (Star, 2019). Price can be further reduced by the economies of scale if demand has been settled. And, consumer awareness and motivation about EVs can further effective in creating demand. Without knowing the consumer demands, the EVs market will have unclear demand. EVs supply in the Malaysian market is already available, however, demand or sale of EVs is not effective. So, this research initiated to identify the factors which can enhance consumer behavior towards EVs sale. Maximum adoption of EVs can be helpful for the Malaysian government to have carbon free environment and attain SDGs of climate change.

2. Literature Review

Generally, innovative technology developers confront obstacles in their efforts to attract users and grow the product's future market share (J. J. Mohr, Sengupta, & Slater, 2010). Researchers have used a variety of motivation models, including the consumer choice model (Bandivadekar, 2008; Hao, Ou, Du, Wang, & Ouyang, 2014; Helveston et al., 2015; Zhang, Yu, & Zou, 2011), a cohort estimation model for vehicle survival (Higuchi, Wada, Nakakubo, & Tokai, 2012), and an agent-based model (Struben & Sterman, 2008). According to Sang and Bekhet (2015), customer purchase behavior is more influenced by social, environmental, financial, performance, demographic, infrastructure readiness, and government intervention. In Malaysia, real EV purchases are extremely low compared to consumer stated preferences (Coffman, Bernstein, & Wee, 2017). Li, Du, and Wei (2014) used the Probit model to label the factors that influence the purchase intentions of electric and flexible fuel vehicles. Human behavior has been investigated in a variety of ways by many researchers. For example, Ajzen (1991) proposed the (TBP) theory of planned behavior, which enables individuals to choose their conduct based on comprehensible evaluations. Diffusion of forecasting models for the electric vehicle market proposed by various researchers (B. M. Al-Alawi & T. H. Bradley, 2013; Becker, Sidhu, & Tenderich, 2009). Sheth, Newman, and Gross (1991) demonstrate in their study that perceived value (PV) functionalities are not restricted to price and quality considerations. PV also refers to an overall assessment of the products' customer performance (Bolton & Drew, 1991; Patterson & Spreng, 1997). PV appears to be an effective predictor of consumer behavior, enabling businesses to increase the value of their products (Geyskens, Steenkamp, & Kumar, 2006). Numerous elements affecting customer behaviour toward items are described in detail below.

2.1 Motivational Factors

Numerous factors that can improve customer behavior have been discussed. Effort expectancy, performance expectancy, government incentives, societal influence, environmental concern, perceived enjoyment, new technology, and fuel efficiency are all similar constructs that have been utilised in the literature. The purpose of this study is to discuss encouraging aspects that appear to be significant in enhancing customer behavior. T.L. Childers (2001) discovered the intrinsic motivational variables (customization, advancement, and perceived enjoyment) that can boost customer behavioral intention in his study. However, the other constructs described above have not been used in the context of motivating factors. This study will examine the elements that influence consumer motivation to acquire electric vehicles.

Four motivational variables to increase consumer adoption intention have been identified as a motivator in the pursuit of EVs based on an exploratory study.

2.1.1 Fuel Efficiency

Consumer acceptance of EVs is heavily influenced by their purchase price (Lane & Potter, 2007). Electric vehicles are regarded as more fuel-efficient and have a cheaper long-term fuel cost than conventional combustion engine vehicles (Lane & Potter, 2007). Lower gasoline costs can be an effective strategy for customer incentive, as humans are wired to seek efficiency and cost savings. The fuel economy benefit can be used to attract and persuade consumers to purchase EVs (Ozaki & Sevastyanova, 2011). The fuel economy and low maintenance costs of EVs can be used to influence customer behaviour; through advertising and awareness, consumer motivation to purchase sustainable vehicles can be increased. Numerous studies have demonstrated that ICE users can save money on higher fuel and gasoline costs in the long term by adopting these low-cost EVs (B. Al-Alawi & T. Bradley, 2013; Prud'homme & Koning, 2012; Tseng, Wu, & Liu, 2013; Wu, Dong, & Lin, 2014).

H1: Fuel Efficiency will positively affect consumer's adoption intention towards EVs.

2.1.2 Technophilia

Technophilia is a term that refers to a consumer's enthusiasm for, openness toward, and curiosity with technology. According to Rogers (2003), consumers are eager to adopt technophiles during the early stages of product development when the product is not widely available on the market. Hirschman (1980) viewed new technology goods as an attempt to discover something novel and novel. Being technologically savvy and suspicious about novel products increases consumer propensity to purchase (Egbue & Long, 2012; Oliver & Rosen, 2010). While driving electric vehicles, consumers share their experiences with new technology with others (Axsen & Kurani, 2012). New products affect a consumer on the lookout for breakthrough technology (Biswas & Roy, 2015; Im, Bayus, & Mason, 2003). The product's efficacy is a critical component in determining whether or not novel technology will be accepted (Venkatesh, Morris, Davis, & Davis, 2003).

H2: Technophilia will positively affect consumer's adoption intention towards EVs

2.1.3 Perceived Enjoyment

According to experts, perceived happiness may be divided into two categories: helping others and socializing with friends. Hsu and Lin (2008), described enjoyment as "enjoyment and fun" when users of the internet participate in social networking sites. They also indicated that enjoyment is a component that influences users' intention to participate. Venkatesh (2000) quantified technology through the lens of perceived enjoyment, which he defined as "the degree to which a certain system action is seen to be delightful, independent of any repercussions of performance by using the system." According to Liao, Tsou, and Shu (2008); (Venkatesh, Thong, & Xu, 2012), perceived enjoyment has been regarded as the most effective motivator, as it affects human attitude and intention toward a certain thing. Perceived enjoyment and ease of use have been found to be more predictive of attitude toward the purchase than perceived utility (Liao et al., 2008). being an innovative technology, have a faster acceleration and a smoother ride than conventional vehicles, which may benefit consumers' adoption of EVs (Miao, Xu, Zhang, & Jiang, 2014).

H3: Perceived enjoyment will positively affect consumer's adoption intention towards EVs.

2.1.4 Environmental concerns (EC)

Consumers' sustainable environmental concerns influence their purchasing decisions about environmentally friendly products (Balderjahn, 1988; Ellen, Wiener, & Cobb-Walgren, 1991; Martin, Shaheen, Lipman, & Lidicker, 2009; Roberts & Bacon, 1997). The delicate issue of energy conservation in light of climate change, as well as increased awareness of clean and safe energy, are obvious facets of being environmentally conscious (Zimmer, Stafford, & Stafford, 1994). Recent research have demonstrated that innovative and sustainable automotive technology can help consumers make more environmentally conscious choices (Ewing & Sarigöllü, 1998; Gould & Golob, 1998; Schuitema, 2013). Environmental concern is a major predictor of evolving consumer attitudes toward EVs and has a considerable positive effect on EV purchase intentions (Sabrina Habich Sobiegallaa, December 2018). Yadav and Pathak (2016) assert that environmental concern has emerged as a critical predictor of behavior toward green items.

H4: Environmental concern will positively affect consumer's adoption intention towards EVs.

2.1.5 Perceived Environmental Knowledge (PEK)

PEK is defined as persons who possess knowledge of the environment, the earth's ecology, and the effects of human actions on the environment (Arcury & Johnson, 1987). Hines, Hungerford, and Tomera (1987) described environmental knowledge as having two domains: concrete and abstract. While abstract knowledge refers to possessing information and knowledge about environmental problems and their solutions, concrete knowledge refers to knowledge about behavior that has a tangible impact on the environment. Consumer research has a considerable impact on decision making; the information gathered and organized by an individual is contingent on the perceived knowledge he holds (Alba & Hutchinson, 1987). The consumer's perception of a product is determined by the information and knowledge about it (Murray & Schlacter, 1990), as is the sort of information employed in the product decision-making process (Brucks, 1985). Environmental awareness can be a powerful motivator of consumer behavior (Boo & Park, 2013). According to Chan, Hon, Chan, and Okumus (2014), employees who have a favorable perception of environmental knowledge, awareness, and concern influence consumer behavior. L. A. Mohr, Eroğlu, and Ellen (1998) used the widely used measure of Perceived environmental knowledge.

H5: Perceived Environmental Knowledge will positively affect consumer's adoption intention towards EVs

2.2 Diffusion of Advertisement

Advertising enables a business to make its products known to the public, which is made feasible through the use of social media (Berger, 2015). Misperceptions and a lack of information about EVs must obscure the consumer concept of revolutionary technology (O'Neill, Moore, Kelleher, & Brereton, 2019). Given the low level of customer awareness and knowledge of EVs, social media can be extremely beneficial in influencing consumer purchasing behavior. In today's environment, customers are more concerned with the use of various social media platforms such as WhatsApp, Facebook, YouTube, Twitter, and

Google+ (Alalwan, Rana, Dwivedi, & Algharabat, 2017; Kapoor et al., 2018; Kim & Kim, 2018; Shareef, Mukerji, Dwivedi, Rana, & Islam, 2019). The social media platforms mentioned above enable humans and organizations to create a new educational, social, commercial, and political space for information sharing and interaction around items (Hawkins & Vel, 2013; Rathore, Ilavarasan, & Dwivedi, 2016; Usher et al., 2014; Zeng & Gerritsen, 2014; Zhu & Chen, 2015). The dissemination of advertisements regarding EVs on these platforms has the potential to increase customer awareness and persuade people to acquire these vehicles. Social media has the potential to alter human behavior and nature in relation to products, society, and organizations. Social media boosts marketing efforts and serves as an active platform for advertisement on a global scale. Advertisements can help increase the consumer's awareness of a certain product. The degree of EV adoption is quite low, and the primary reason is that most consumers are unfamiliar of EVs and their characteristics. Advertisement can be credited with influencing consumer preferences and values in favor of products.

H6: Diffusion of advertisement will positively moderate the relationship between fuel efficiency and adoption intention towards EVs.

H7: Diffusion of advertisement will positively moderate the relationship between technophilia and adoption intention towards EVs.

H8: Diffusion of advertisement will positively moderate the relationship between perceived enjoyment and adoption intention towards EVs.

H9: Diffusion of advertisement will positively moderate the relationship between environmental concern and adoption intention towards EVs.

H10: Diffusion of advertisement will positively moderate the relationship between perceived environmental knowledge and adoption intention towards EVs

2.3 Diffusion of Innovation (DOI)

DOI is the most relevant theory for examining the intention of technology users to adopt new technologies in enlightening situations (Medun, 2001). Diffusion research requires innovation in technology, which is why Rogers (2003) used the terms innovation and technology interchangeably. According to Rogers (2003), adoption is defined as "the optimal method for utilizing the invention as a readily available resource," and rejection is defined as "the decision not to adopt an innovation." The diffusion process is described as "the process by which innovations are communicated among society members via certain communication channels at a specific period" (Rogers, 2003). This definition's primary components are innovation, communication routes, society or social members, and time.

According to Rogers (2003) these components are "diffusion as a process of communication about an innovation among social members through communication channels in a certain period."

"Communication as a process in which members of society create and share information with others in order to achieve mutual understanding"

"Process of Innovation dissemination, categorization, communication, and acceptance rating required time dimension" and "Social System as a set of connected units engaged in specific issue solving to reach a shared purpose."

Diffusion of Innovation in Motivation can occur when new technological vehicles are discussed among society members via certain communication channels. Consumer motivation for specific products can be increased via DOI. This hypothesis is important in characterizing the diffusion of innovative vehicles among members of society.

2.4 Theoretical Model

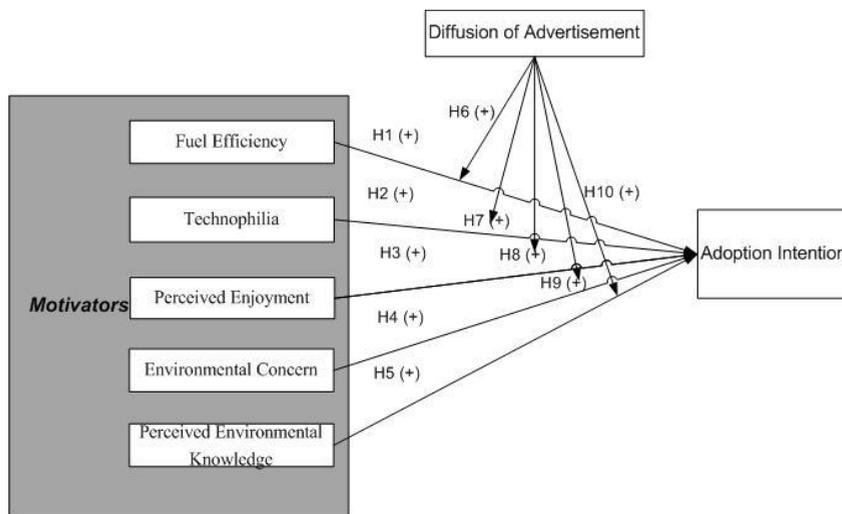


Fig 1: Theoretical model

Theoretical Framework of the Study

The structure depicted in Figure 1 describes the independent and dependent variables, as well as their connection, based on the literature review described. This framework has two features to explore, first the relationship between fuel efficiency, technophilia, perceived enjoyment, environmental concern, and perceived environmental knowledge towards adoption intention. And the second moderating effect of diffusion of advertisement to influence consumer adoption intention towards EVs.

3 Conclusion

The worldwide government acceptance of EVs is helpful to reduce transport carbon emission and to attain the sustainable development Goal of Climate Change, however, the demand for EVs among consumers is very low. The motivating factors suggested in this study will be effective to enhance consumer adoption behavior towards EVs. The advertisement diffusion will be helpful to enhance consumer awareness and encourage them to buy these sustainable innovative EVs. With the help of advertisement, the motivation level of the consumer will be encouraged to develop purchase behavior towards EVs. Motivational factors with the help of advertisement can enhance consumer adoption intention of EVs, as these are sustainable and environmentally friendly which will help to reduce the transport GHG emission. Sustainability depends on the three pillars that are: environment, society, and economic development. This study suggested the solution to enhance consumer motivation towards different prospects of EVs. This study suggested the concept of enhancing consumer motivation. Future research could be possible on the implementation of these studies into actual data. The causal relationship in the paper is still unknown so structural equation modeling can be applied to further studies analysis. This paper roughly analyzes the different variables, the deeper relationship among these could be applied to other innovative technologies.

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