Factors influencing consumers' intentions to purchase electric vehicles in Egypt

Dr. Noha Ibrahim Taha Badr

Lecturer at Faculty of Financial and Administrative Sciences

Pharos university in Alexandria

Introduction

The effect of human activity over the years has led to global warming on the planet. Anthropogenic greenhouse gas emissions (GHG) are the main causes of global warming (Pachauri and Mayer 2015). These emissions have led largely to the increase in concentrations of carbon dioxide (CO2), methane (Ch4) and nitrous oxide (N2O) in the atmosphere from the pre-industrial era ((Pachauri, R. K., and L. Mayer, 2015). It is appraised that between 1970 and 2010, emission of CO2 from fossil fuels constituted 78% of GHG emissions (Pachauri, R. K., and L. Mayer, 2015)).

Green goods is Purchased of is growing amongst customers and organizations. Also, vehicle manufacturing companies worldwide employ, safety, and green technologies and methods when manufacturing cars to reduce the harm on human beings and the environment ((Karurkar, et., al., 2018)). Thus, Green marketing provide helpful effect on health and the environment. It also promotes coordinated cleanliness efforts in both production and consumption. At the same time, people are aware of natural products and pure way of products' manufacturing, consuming, and disposing. ((M.D., P., & Akhil, A., 2017)). On one hand, environmentally friendly vehicles, have low noxious emissions and fuel-efficient, with different types of environmental vehicles offered on the market, involving hybrid vehicles, hydrogen vehicles, electric vehicles, and solar vehicles (Joshi, N., & Rao, P. S., 2013)).

These developments have compelled Supranational Organizations like the United Nations Framework Convention on Climate Change (UNFCCC) and various governments around the world to develop strategies for reducing greenhouse gas emissions to ensure sustainable development. One of the strategies is to ensure sustainable transport by introducing electric vehicles. This has been done in several countries including the Netherlands, Germany, the United States, Spain, Norway, China, etc. Electric vehicles – hybrid electric (HEV), plug-in hybrid electric (PHEV), or battery electric vehicle (BEV) technologies – provide the promise for a steady decline of energy consumption and GHG emissions (Guo et al. 2020; Massiani 2014; Shen et al. 2012). The benefits of electric vehicles are further corroborated in a report commissioned by the European Climate Foundation (2018)

which summarized that there was substantial reduction in GHG when there was a move from internal combustion engines (Kang, et., al.,, 2019); (Schuller, A., and C. Stuart, 2018); (Rothkrantz, et., al., 2013)).

Literature review

Given that this study is inclined toward investigating the factors that influence the purchase intention of electric vehicles in Egypt, it is of necessity to review the existing body of literature concerning the adopted theory (Theory of Planned Behavior), its modifications and the important variables that have been found to be antecedents of purchase intention.

The Theory of Planned Behavior was drawn up to foretell and demystify human behavior in specific contexts ((Ajzen, 1991)). The TPB was built off of what was assumed of human behavior in the Theory of Reasoned Action (TRA) ((Ajzen, I., and M. Et Fisbein, 1980)). Both theories are based on the evidence that individuals make logical, reasoned decisions to engage in specific behaviors by evaluating the information available to them ((Ryan, S., and A. Carr, 2010)). However, the TPB was developed due to the discovery that individuals' behavior is not totally voluntary and cannot permanently be controlled; therefore, supposed behavioral control was added to the TRA, which was then renamed the TPB ((Arafat, Y., and M. I. M. Ibrahim, 2018)). Therefore, in the TPB, peoples' action or behavior is suggested to be influenced by their behavioral intention which is also as a consequence of their personal attitude and opinion in combination with their perceived control of the behavior and societies' subjective norms. The attitude, subjective norms, and perceived behavioral control of individuals which are determined by underlying beliefs can take a positive or a negative impact on their intention and the performance of the behavior. For example, individuals will be more likely to engage in a behavior if they have a positive attitude and feel that they have control of this behavior ((Conner, 2002)). However, a negative attitude toward a behavior and less control of it prevents the behavior from being performed. Additionally, if that specific action/behavior has the support of the people within society, it will impact positively on a individual's intention for the action and therefore encourages the action to be approved (Conner, 2002) Generally, individuals intention to accomplish the behavior in question will be stronger when their attitude and subjective norms are more satisfactory toward a behavior; and they have greater perceived behavioral control (Ye, et. al., 2021)

An important construct within the framework of the theory of planned behavior is a person's intention to perform a given behavior. Intention is a cognitive state that represents the motivation or willingness of people to engage in a certain behavior (Conner, 2002). The intention to perform a behavior has been reported to precede the actual behavior – a higher intention may cause the intended behavior to occur (Ajzen, 1991). From the previous discussion, it has been established in the TPB that three concepts determine intentions: attitudes, subjective norm, and perceived behavioral control. The popularity of the TPB in predicting intention is without

question. In transportation research, it has been employed to predict consumer intentions to purchase safer cars (Kassim, et., al., 2016), adults' intentions to adopt cycling to work in Egypt (Acheampong, 2017).

In spite of the application of Ajzen's TPB across a wide range of disciplines over the past several years, it has been found to have a number of limitation concerns. As listed by (LaMorte, 2021) the TPB is limited in the following ways:

- It adopts the person has acquired the opportunities and resources to be successful in performing the desired behavior, regardless of the intention.
- Behavioral intention and motivation, such as fear, threat, mood, or past experience are not accounted for.
- In spite of the consideration of normative influences in the TPB, the theory still does not take into account economic or environmental factors that are likely to influence behavioral intentions.
- It believes that behavior is the result of a straight decision-making process, and does not take into consideration that it can change over time.
- While the added construct of perceived behavioral control was an important addition to the theory, it does not say anything about actual control over behavior.
- The time frame between 'intent' and 'behavioural action' is not addressed by the theory.

In response to the aforementioned limitations, other constructs from behavioral theory have been added to the TPB by researchers to make it a more integrated model. According to (Ajzen, 1991) other constructs (variables) can be added to the TPB especially when those variables clarify a significant proportion of the variance in intentions. It is conceivable to spread the theory in other parts by adding variables like belief salience, past behavioral habit, moral norms, self-identity, and effectiveness to increase the predictive power (Armitage and Conner 2001; Conner and Armitage 1998). Many extensions have thus been made to the theory; for example, in exploring the factors influencing using electronic vehicle intentions, the theory was expanded to include .environmental concern, consumer knowledge, psychological benefits, infrastructure readiness, and demographics to enrich the forecast of behavior of consumers (Sang, Y.-N., and H. A. Bekhet, 2015); in other research the factors affecting consumers' green commuting in China were extended to incorporate environmental concerns to the theory furthermore to determinants such as attitudes, intentions, subjective norms, and apparent behavioral control (Kai and Haokai 2016).

behavior

Based on the available materials reviewed, the theory of planned behavior was expanded to include variables such as personal moral norm, environmental concerns, consumer knowledge, and government policy to help improve the predictive validity of this study. This study attempted to investigate only purchase

intentions since examining actual purchase is not feasible – there is no record of electric vehicle usage on any scale in Egypt.

Attitudes

Attitude refers to the extent to which a person has a favorable or unfavorable evaluation of the behavior in question. It is an individual's feeling – positive or negative – about performing a behavior (Kai, C., and L. Haokai, 2016) (Ajzen, 1991)established that attitudes affect intentions significantly – an increase in attitudes will lead to an increase in intentions. Attitudes are shaped as a result of direct feelings, experiences, and what we perceive to expect from other people; for example, a study found that people bought specific car brands based on their fondness of those car brands (Narteh, B., R. Odoom, M. Braimah, and S. Buame, 2012) On the other hand, attitudes can also develop reasonably from the beliefs people hold about the object of the attitude (Ajzen, 1991)Peoples' beliefs are formed by attaching certain traits or feature to an object; that is, positive or negative views of an object, action or feature (Ajzen, 1991) ; for example, we may have a positive (safety) attitude toward the wearing of car seatbelt. We therefore develop an attitude automatically toward a behavior based on the positive or negative attributions we make toward that behavior. Consequently, we have a favorable disposition toward attitudes that lead to desirable outcomes and unfavorable dispositions toward undesirable outcomes (Ajzen, 1991)). (Wang, et.,al., 2016.) found that attitudes substantially predicted the intentions of the respondents in the area of electric vehicles.

Subjective norms

The second predictor, a social factor termed subjective norm, is the perceived social pressure to perform or not to perform the behavior; in other words, subjective norms focus on whether the person is affected by the people around them to behave in a certain way or not (Ajzen 1991). Driving an electric vehicle represents a certain symbol such as status enhancement, differentiation from others, et cetera (Simsekoglu, Ö., and A. Nayum, 2019) . These are important in adoption of electric vehicles as driving electric cars has been found to relate well with social and self-identity. A study found that the acceptance of society and significant others affected the intentions of respondents to cycle (Acheampong, 2017)). Similarly, Malaysian consumers were also influenced by their relatives and friends to purchase electric vehicles (Afroz, et.al.., 2015)

Perceived behavioral control

Perceived Behavioral Control estimates how easy it is for an individual to perform a behavior. This may be based on what happened in the past as well as an expectation of circumstances that will make it impossible to perform the behavior (Ajzen 1991). Purchase price has been found to be a significant factor in consumers' behavior, for example, price, brand, engine power, emission, fuel economy, car size-style are the preferred factors in Sweden (Chowdhury, M., K. Salam, and R. Tay,

2016). Another study confirmed this when it was established that vehicle fuel cost and cost of an electric vehicle impacted on consumer choice (Hackbarth, A., and R. Madlener., 2013) Maintenance cost also affect intentions – it includes the cost of replacing oil filter, fuel filter, and air filter (Wang, N., and Y. Liu., 2015)In a survey of a thousand residents, respondents rated low usage cost ahead of environmental benefits and respondents whose attention was focused on low usage cost were likely to buy electric vehicles (Krupa et al. 2014). In considering alternative fuels, including vehicles powered by electricity, the issue of available infrastructure plays a great role in buying electric vehicles (Liao, Molin, and Van Wee 2017). The market penetration for electric vehicles will improve with fast-charging infrastructure – which ultimately also support long-range drive (Liao, F., E. Molin, and B. Van Wee, 2017), in their review of several studies, found that the availability of charging infrastructure had a significantly positive effect. Consumers prefer that charging stations are readily available at shorter distances Since electric vehicles are fueled partially or fully by electricity, there is need to have power which is reliable. There are worries that the distribution and transmission infrastructure may be inadequate or not available where there is need for it (Scarcella, G., C. Zubaryeva, A. Alemanno, C. Thiel, and G. Pasaoglu., 2012)The perceived quality of service complemented by maintenance services for electric vehicles is important as well. Consumers' adoption of electric vehicles will depend on these factors as well (Ng, M., M. Law, and S. Zhang., 2018) confirmed this in their study – those consumers were worried about the availability of sales points and maintenance centers.

Consumers value the attributes of a car – performance of the car, car esthetics, reliability, and many other attributes (Lee, H., and G. Lovellette, 2011)It has been established that driving range is a main concern for possible electric vehicle buyers (Hackbarth, A., and R. Madlener., 2013); (Simsekoglu, Ö., and A. Nayum, 2019). Normally, consumers would want to purchase a car which has the same range or a superior range to their previous buy.

Personal moral norms

Personal moral norm is defined as the extent to which an individual feels morally obliged to perform a particular action (Sia, S. K., and A. Jose., 2019). The addition of personal moral norm can improve the prediction of intentions to act out a behavior, especially that affecting the environment. Achnicht (2012) found that German consumers were conscious of environmental concern; therefore, they did not mind paying considerable amounts to fulfill their responsibility. On the contrary, Wang et al. (2016) found that personal moral norm did not increase the explained variance by the amount expected when compared with international studies; this was explained by the collectivist disposition (subjective norm) rather than individualistic outlook (personal moral norm) of the Chinese (Wang, S., J. Fan, D. Zhao, and S. Yang. 2016.) Generally, nations with high collectivist nature have higher levels of social influence, this is however moderated by people's disposable income (Kongsompong, K., R. T. Green, and P. G. Patterson., 2009). People with higher

income tend to have an individualistic nature irrespective of the cultural orientation of nationals (Kongsompong, K., R. T. Green, and P. G. Patterson., 2009)

Environmental concerns

Environmental concern is a very important factor in acceptance and uptake of electric vehicles; because using an electric vehicle is seen as a necessary step which will help protect the environment (Rezvani, Z., J. Jansson, and J. Bodin., 2015). As the degradation of the environment in recent years has heightened consumer concerns, calls have been made for an examination of how consumer awareness and environmental concerns are related. It has been proved that a substantial relationship exists between environmental concerns and attitudes toward Alternative-Fuel Vehicles – the more concerned a consumer was about the environment, the positive his/her attitude toward alternative-fuel vehicles (Turcksin, L., O. Mairesse, and C. Macharis., 2013). This is corroborated in a study which established that people who were very concerned about the environment were likely to purchase electric vehicles (Krupa, et. al.,, 2014). In a study, existing owners and potential owners rated emissions ahead of fuel efficiency partly because the Swedes viewed the outcome of greenhouse emissions and climate change to be of a higher cost, and so they were ready to pay to mitigate the consequences of emissions and climate change (Chowdhury, M., K. Salam, and R. Tay., 2016). Research by (, van Rijnsoever et., al., 2013) also found that the most important attributes in determining vehicle choices are the initial purchase prices and local emissions.

Consumer knowledge/awareness

Consumer awareness can be defined as the appreciation, understanding, or familiarity with facts, information, descriptions, or skills acquired through experience or education ((Sang, Y.-N., and H. A. Bekhet, 2015)). The consumers awareness about a product helps to forecast behavior in terms of the adoption of a product for instance, in the matter of household energy efficiency in Ireland, it was create that ownership of energy saving items in the home was rather low in Ireland due to wrong or lack of information about the energy conservation item (Sang, Y.-N., and H. A. Bekhet, 2015) The key determinants of acceptability of hydrogen fuels were established to be awareness and prior knowledge The uncertainty about the performance and safety of electric vehicles is due to the fact that consumers do not have much knowledge about the history and characteristics of electric vehicles unlike internal combustion engines (Simsekoglu, Ö., and A. Nayum, 2019) established that car buyers who are aware of environmental issues are very likely to buy alternative-fuel vehicles, no matter how environmentally friendly or unfriendly a car is; this is contradicted somewhat by Simsekoglu and Nayum (2019) who posit that the relationship between intentions and consumer awareness is weak.

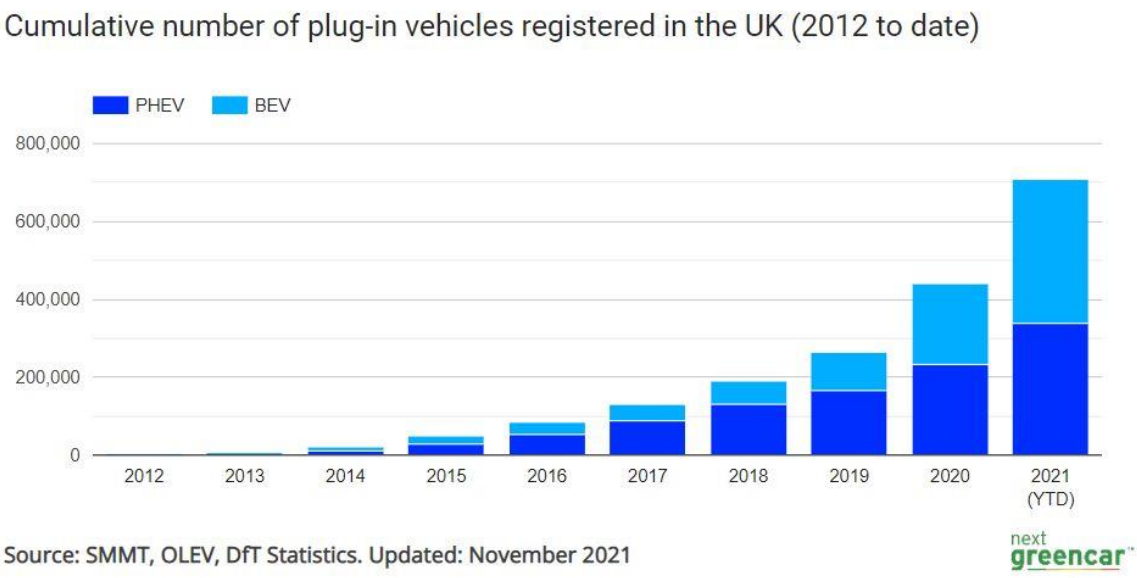
Government policy

In the nascent stages of electric vehicle growth, government is the driving force (Wang, N., and Y. Liu., 2015) To encourage electric vehicle uptake, policies must be developed by governments to achieve this – the policies could be monetary incentives and non-monetary incentives (Wang and Liu 2015). The incentives could include subsidies for those who buy or install home charging equipment, purchase incentives (reduction of taxes in the price buildup of electric vehicles), providing tax holidays for those who set up charging infrastructure and reducing electricity cost. It could also be in the form of taxes placed on high emissions-generating vehicles. A typical example of rebates is the 5.7% rebates given on purchase price in Japan (Tanakaet., al., 2014, 2014). The non-monetary incentives could include road tolls exemptions and free public charging; for example, some cities in Europe have placed travel restrictions, through schemes like cordon pricing (Lee, H., and G. Lovellette, 2011)It has been argued that tax subsidies go a long way in encouraging consumer purchase more than any other supporting incentives (Gallagher, K. S., and E. Muehlegger,, 2021) Furthermore, it is established that environmental regulations, oil price policy, purchase subsidies, and the charging infrastructure construction improves the market penetration of cleaner vehicles (Lane, B., and S. Potter., 2007)

Comparison between Egyptian market and foreign market

ELECTRONIC VEHICLE sales are back on track. A total of 2,65 million new ELECTRONIC VEHICLEs found new holders during the first half of 2021, an increase of +168 % compared to 2020. The current increases speak hyper-growth but need to be seen relative to the low base of 2020 H1. During the 1st wave of the pandemic, global sales of ELECTRONIC VEHICLEs stayed -14 % below 2019 H1 volumes as vehicle markets declined by -28 % during 2020 H1. The market recovery shaped up in 2020 H2 with rapid gains in volumes and shares for ELECTRONIC VEHICLE, esp. in Europe, driven by attractive products, extensive green recovery funds and the 95g CO2 mandate. (Irle, 2021)

The following chart shows the number of electric cars registered in the UK – as of the end of November 2021 there were more than 705,000 plug-in vehicles with approximately 365,000 BEVs and 340,000 PHEVs registered. Last year saw the biggest annual increase in number of registrations, with more than 175,000 electric vehicles registered showing a growth of 66% on 2019. Last year, despite the coronavirus impact, the chart showed that 2020 was a huge growth year for plug-in vehicles. (Lilly, 2021)



lectric cars record sales growth of 10.9%, with total of 1.78 million cars in during first nine months of 2020, compared to 1.61 million units during 2019 (Egypt, 2021)

The Egyptian government is exerting great efforts to localize electric vehicle (EV) technology by supporting and encouraging consumers to use the new environmentally friendly mobilization method, to keep pace with the global shift towards clean energy. In June 2020, El Nasr Automobiles signed a memorandum of understanding with China's Dongfeng to produce the car "Nasr E70" with a local manufacturing rate of 50%, gradually reaching 100%, whose prices were estimated at EGP 300,000, after being supported by the Egyptian government. According to the business sector plan, 25,000 electric cars will be produced and manufactured annually, and production will start at the end of next year, provided that they will be available in the Egyptian market in the first half of 2022. (Egypt, 2021)

Global ELECTRONIC VEHICLE sales for 2019 and 2020 stayed below trend. In 2019 when "regulatory storms" in Europe and China reduced demand and supply of popular offers. In Europe, the WLTP introduction forced many high-selling PHEV models into the shop for e-range upgrades. In China, regulators cracked down on products with insufficient safety and range. Lots of models had their sales stopped and several combatants went out of business. In 2020, the first wave of Covid-19 caused and unprecedented slump in car sales but also increasing support by policy makers. In both years, electronic vehchiles sales would have been higher, in a business-as-usual situation. (Irle, 2021)

(Taher S. and Shafie R., 2021) approve in their research that green marketing mix had a substantial positive effect on the consumer's switching behavior concerning eco-friendly automotive products. Moreover, it has been experimental that different genders, ages, levels of education, and marital statuses of Egyptian

consumers affected their attitude regarding eco-friendly automobile products, while the level of income did not influence it.

Consumer switching behaviour emerges as they disregard their current product supplier for another supplier's product, with the initial supplier having lost potential income and being required to pay for attracting new consumers Thus, this study aims to expand the awareness of the marketing mix strategies that affect the shifting of Egyptian customers to buy eco-friendly vehicles. With acknowledging the serious environmental challenges, possibly resulting from the unsustainable use of power and non-renewable environmental assets, the abundant food and goods' supplies, non-environmental manufacturing practices as well as environmental hazards, a growing number of people are environmentally aware, fearing the scarceness of natural resources and the fragility of the environment. (Taher S. and Shafie R., 2021)

Mangerial implications:

From our reading we recommend the following:

Enhancing the green products' consistency and seeking to improve their strength. Employing facilities and the latest technology for acceptable designing, manufacturing, pricing, promotion, and delivery.

Considering the environment and creating an environmental marketing department, planning the framework, mobilizing sufficient resources and opportunities by companies.

Conclusion

✔ Environmentally sustainable car manufacturers must follow improved strategies for battery operation, like battery sharing, while enhancing the production of battery technology, as customers claim that the price and lifespan of batteries would influence their purchasing intentions. Manufacturers should incorporate the idea of an automotive recycling economy, involving automotive retrieval and battery-powered recycling, aiming at
minimizing the cost of batteries by reusing scrap cars and their components, recovery as well as waste recycling to encourage safe and balanced growth of the automotive industry.

✔ As customers expect that the charging batteries' number for electric cars would influence their buying behaviour, the government is proposed to implement a pilot model of battery charging as a prototype in major cities, and then draw investment from the related producers by incentives to ease the challenge of electric vehicle charging.

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