Extending Technology Acceptance Model to Study Electric Vehicle Purchase Intentions in Egyptian

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Abstract

Due to growing concern about greenhouse gas emissions from vehicles, global economies are adopting alternative fuel technology. Electric vehicles (EVs) are touted as a green and clean technology that might save natural resources and transition to a low-carbon transportation system. However, knowledge of EVs are rare, especially in developing countries. Therefore, this research aims to establish a theoretical basis based on Technology Acceptance Model (TAM) to broaden the knowledge of customers' acceptance of using EVs. A self-administered questionnaire was developed. The hypotheses were simultaneously tested on a sample of 564 participants to assess the research model. The results show that the consumer attitude toward electric vehicles is mediating the relationship between (perceived ease of use, price sensitivity, and perceived barriers). In contrast, it is not mediating the relationship between (Perceived usefulness, Knowledge of EVs, Environmental concern, and Green trust) and purchase intention. Moreover, the subjective norm is affecting the individual's purchase intention. Research may include new variables in the future.

***Keywords**: Technology Acceptance Model, Green Trust, Knowledge of Electric Vehicles, Electric Vehicle Perceived Barriers, Purchase Intention..*

Introduction

The increasing prominence of electric vehicles (EVs) has garnered considerable interest in contemporary times, primarily driven by apprehensions regarding environmental sustainability and the imperative to curtail greenhouse gas emissions. Electric vehicles (EVs) have the potential to contribute to the reduction of emissions, improvement of air quality, and decrease in reliance on fossil fuels. One of the UN sustainable development goals is to decrease greenhouse gas emissions all over the world. Therefore, electric vehicles (EVs) are one of the main drivers that the world has been forced to accept (Brase, 2019; Huang, Lin, Liu, Lim, & Li, 2022; Jajja, Hassan, Asif, & Searcy, 2021; Simsekoglu & Nayum, 2019). The market ratio of these electric vehicles is still very low. To encourage the use of clean energy, the Egyptian government has issued Decree No. 419 for the year 2018 on the tariff, which includes the introduction of an international item for vehicles with electric motors.

Since consumers' behaviour is directly predicted by intentions, several studies in the literature applied the theory of planned behaviour to predict the possible consequences of consumer behaviour to adopt electric

vehicles (e.g. Moons and De Pelsmacker 2012; Sang and Bekhet 2015; Malhotra 2022). Accordingly, there is a lack of research to investigate the adoption of electric vehicles in developing countries (Goel, Kumar, Parayitam, & Luthra, 2023; Kumar, Jha, Damodaran, Bangwal, & Dwivedi, 2020; Onat & Kucukvar, 2022). Moreover, Several studies have mentioned the role of Technology Acceptance Model (TAM) in different positions, such as Sakuljao, Satiennam, Satiennam, Kronprasert, and Jaensirisak (2023) in Automated Vehicles; in addition, Sun and Wang (2019), and Zhou et al. (2021) extended the use of TAM in electric vehicles through using different variables; Jaiswal, Kaushal, Kant, and Kumar Singh (2021) used the same theory to develop a new model by adding risk factors.

Technology Acceptance Model (TAM)

This study will adopt Technology Acceptance Model (TAM) adopted originally from Theory of Reasoned Action. TAM is thought to be the most significant and frequently used theory for describing a person's acceptance of information systems and new technology (Fred D Davis, 1989). It is related to user's behavioural intentions, attitude, perception of the system's usefulness, and perception of the system's ease, all having an impact on how the system is actually used. The TAM was initially intended for information systems, but it was assumed that EVs, a radical technological advancement, would also benefit from it.

Two dimensions were presented by Fred D Davis (1989) to explain and anticipate the individual's acceptance of new technology as the study will use the customer perspective to test the research model. Moreover, Fred D Davis (1989) mentioned that TAM is considered to be a modifiable element. Along with its two primary determinants, usefulness and ease of use, TAM can also incorporate additional factors or motivations to increase its effectiveness through extension or modification by incorporating additional internal and external factors, such as financial incentives, policy or government support, trust, etc. (Jaiswal et al., 2021; Sakuljao et al., 2023). Therefore, it will be suitable for this study as the study extends the TAM model by adding new variables. Consequently, many studies have adopted and extended the TAM theory by adding new constructs, such as Venkatesh and Davis (2000), Venkatesh and Bala (2008), Dudenhöffer (2013), and Liu, Lu, and Niu (2018) in the context of electric vehicles. Therefore, this research extends the use of TAM to investigate the factors that affect consumers' intentions to purchase electric vehicles.

Literature Review and Hypothesis Development

The adoption of electric vehicles in developing countries is a great challenge and requires several studies to identify and investigate the factors that affect their adoption based on each market characteristic. Several challenges were highlighted in the adoption of electric vehicles or the adoption of the battery of electric vehicles (BEVs) in developed countries (I. Ali & Naushad, 2022; Asif, Jajja, & Searcy, 2021; Simsekoglu & Nayum, 2019). Egypt represents a highly diversified market with different cities' infrastructure and at different stages of development, especially after adopting sustainability goals (A. H. Ali, Gruchmann, & Melkonyan, 2022; A. H. Ali, Melkonyan, Noche, & Gruchmann, 2021; Rowan Abd Elbary, 2022). Based on the (Worldometers, 2022), Egypt population is approximately 107 million, who depend mainly on conventional cars. Particularly, future growth in Egypt automobile market is its EV market. Potential growth of EVs will be in capital cities, such as the capital city (Cairo) and second capital city (Alexandria) as such cities are characterized by better infrastructure and high percentage of inhabitants. The government of Egypt works intensively to disseminate the dependency on electric vehicles (EVs) in Egypt, by lessening environmental obstacles for the EV local manufacturing permits, such as custom breaks for EVs components as well as setting a competitive tariff for enhancing electric charging infrastructure (LYNX, 2020). In this context, this research aims to establish a theoretical basis to broaden the knowledge of customer's acceptance of using electric vehicles, in addition to investigating consumers' intentions towards buying electric vehicles in Egypt.

Attitude

In 1991, Ajzen proposed the Theory of Planned Behaviour (TPB), which is related to studying the intention; this theory is extended from Theory of Reasoned Action (TRA) (Ajzen & Fishbein, 1975). TPB proposed that the source of a person's intention to carry out an action that comes from "positive evaluation of the behaviour (attitude), social pressure encouraging the behaviour (subjective norm) and perceived ease of performing such behaviour (perceived behavioural control)"(Wan, Shen, & Choi, 2017, P.69). Therefore, attitude can be defined as "an index of the degree to which a person likes or dislikes an object" (Ajzen, 2005). Determining the factors that affect consumers' attitude towards a behaviour is a key determinant of consumers' intention toward the behaviour. Gaining knowledge of something is essential for illuminating attitudes, intentions, and behaviours regarding EV(A. H. Ali, El Rouby, & Barakat, 2022). The mediating role of attitude has been widely discussed and studied in different contexts, and knowledge and environmental concerns are tested on the intention through the attitude (A. H. Ali, El Rouby, et al., 2022); Lim, Osman, Salahuddin, Romle, and Abdullah (2016). From the theoretical part, many researchers have developed the use of TAM through adopting the attitude. They mentioned that it is considered as main variables to explain the individual intentions to do an action (Bagozzi, 2007; Mathieson, Peacock, & Chin, 2001).

Perceived Ease-of Use and Perceived Usefulness

Fred D. Davis, Bagozzi, and Warshaw (1989) have proposed perceived usefulness (PU) and perceived ease of use (PEU) to identify the factors influencing people's adoption of new information and to explain and forecast how people will react to such a technology. Those two variables are the independent variables for the TAM as they will have an impact on the attitude towards technology use, which will then have an impact on the particular behavior. Perceived ease of use refers to the extent consumers consider a particular innovation or system to be easy to use and effortless. Previous studies indicated the effect of ease of use in predicting individuals' attitudes (Jaiswal et al., 2021; Venkatesh & Davis, 2000).

Perceived usefulness refers to the extent consumers consider a particular technology or system to be useful. Based on previous studies, perceived usefulness has been used in a plethora of domains. Among different studies conducted in different countries, perceived usefulness was found to affect consumers' attitudes and intentions in different contexts, such as internet banking (Albort-Morant, Sanchís-Pedregosa, & Paredes Paredes, 2022), mobile advertising (Kader, Fawzy, & El Essawi, 2021), E-learning context (Kader et al., 2021), and sports marketing context (Mohammadi, Ghasemi, & Jahan Tab Nejad, 2021). Moreover, in electric vehicles' context, perceived usefulness is evaluated according to the value and benefits obtained from these vehicles, such as performance, driving range, and charging duration (Huang et al., 2022; Luan, Filieri, Xiao, & Sun, 2023). In addition, EVs are considered environmentally friendly, which means reducing CO_2 emissions. Based on previous studies, it was found that perceived usefulness affects purchase intention through customer attitude (Asif et al., 2021; Bilro, Loureiro, & Souto, 2023; Shanmugavel & Micheal, 2022; C.-S. Tan, Ooi, & Goh, 2017). Accordingly, the following hypotheses have been proposed.

- H_1: Consumers' attitude towards electric vehicles will mediate the relationship between perceived ease of use and purchase intention.
- H_2: Consumers' attitude towards electric vehicles will mediate the relationship between perceived usefulness and purchase intention.

Perceived barriers

Perceived barriers is not part of the TAM explained by Fred D Davis (1989); however, many researchers integrate and extend the role of perceived barriers to the TAM (Hoffman, Novak, & Schlosser, 2000; Porter & Donthu, 2006; Venkatesh & Davis, 2000). They stated that perceived barriers could be an indicator to the customer intentions and could determine their intention to take an action. In developing countries, lack of infrastructure and adequate regulatory frameworks in developing countries are major barriers for

the adoption of electric vehicles. Governments in developing countries need to work on formulation of policies to support EV adoption. It is noted that barriers existing research is mainly conducted in developed countries, mainly in Europe and US (Jajja et al., 2021; Li, Siddik, Masukujjaman, & Wei, 2021), while it is important to conduct research in developing countries to identify all barriers from businesses' perspectives and consumers' perspectives.

- H$_3$: Consumers' attitude towards electric vehicles will mediate the relationship between perceived barriers and purchase intention.

Knowledge of Electric Vehicles, Environmental Sustainability, and Green Trust

Many studies have found evidence that many variables have an impact on behavioural intention by using TAM. It is a model that is objectively straightforward and that can be expanded or modified in different ways. As a result, the literature included many extensions that included other constructs and different merges and modifications to TAM (Boonsiritomachai & Pitchayadejanant, 2019; Rezaei, Safa, & Ganjkhanloo, 2020; Verma & Sinha, 2018). Kulviwat, Bruner II, Kumar, Nasco, and Clark (2007) stated that when the customer has enough knowledge about the product, this would generate a better attitude to adopt it. Heeren et al. (2016) illustrated that better knowledge leads to determine consumers' green decisions and affect intention and behaviour. Knowledge leads to a higher green trust(AL-Khatib, 2023). Consumers' acceptance of adopting products is based on environmental performance, dependability, and environmental functioning (Hossain, Nekmahmud, & Fekete-Farkas, 2022).

The most crucial element encouraging consumers to choose green products is his knowledge and green trust toward the product. Consequently, knowledge of EVs influences consumers' purchase decision through their attitudes (Dash, 2020; Roh, Seok, & Kim, 2022); in addition, increasing the knowledge would increase the customer trust and would affect its behaviour. Consumers' decisions to buy energy-efficient products are most influenced by their level of trust in those products. Accordingly, green trust has been a critical antecedent of consumer adoption of EVs (Globisch, Plötz, Dütschke, & Wietschel, 2019) and of their decisions too (Hossain et al., 2022; Wasaya et al., 2021).

Regarding environmental sustainability, it positively influences the behaviour of individuals towards green consumption, recycling, and all eco activities. Environmental knowledge influences environmental attitudes, which in turn affect pro-environmental behaviour. Consequently, the following hypotheses are proposed:

- H$_4$: Consumers' attitude towards electric vehicles will mediate the relationship between knowledge of EVs and purchase intention.

- H$_5$: Consumers' attitude towards electric vehicles will mediate the relationship between environmental concern and purchase intention.

- H$_6$: Consumers' attitude towards electric vehicles will mediate the relationship between green trust and purchase intention.

Price Sensitivity

One of the sensitive constructs that have been added to the model is price sensitivity. Many studies have proven that it is related to attitude and usage intentions in the EV (Ghali-Zinoubi & Toukabri, 2019). Price sensitivity is the extent to which changes in a product's price have an impact on consumers' purchasing decisions (Zepeda & Deal, 2009). Consumers' price sensitivity differs from one individual to the other. It is noted that the prices of electric vehicles is higher compared to those of the conventional cars. Individuals who are fans of technology and concerned of various practical aspects of electric vehicles are less price sensitive. According to Sun and Wang (2019), price sensitivity influences the customer decision for buying and negatively affects consumers' attitudes towards electric vehicles.

- H$_7$: Consumers' attitude towards electric vehicles will mediate the relationship between price sensitivity and purchase intention.

Subjective Norms

The basic TAM has the drawback that social influences have been ignored. However, the combination between TAM and Theory of Planned Behaviour (TPB) (Ajzen, 1991) has put subjective norm on the track as done in Venkatesh and Bala (2008). Subjective norms are defined as the social pressure that results from an individual's choice to engage in a particular action or not (Ajzen & Fishbein, 1975; Mo, Boadu, Liu, Chen, & Ofori, 2022). This pressure is primarily generated by "normative ideas" and "desire to comply." Based on Barki and Hartwick (1994); Taylor and Todd (1995) and Venkatesh and Davis (2000) studies, in the early stages of technology adoption, subjective norms are a stronger predictor of intention.

- H_8: Subjective norms will positively affect consumers' intentions to purchase EVs.

Purchase Intention

According to technology acceptance model (TAM) in several studies, it was noted that behavioural intention is a key determinant of behaviour usage. In addition, TAM, which has a strong correlation to purchase intention according to empirical evidence, has been used and explained in numerous studies (Rondan-Cataluña, Arenas-Gaitán, & Ramírez-Correa, 2015). Innovative products are characterized by different features that influence consumers' perceived usefulness and affect their purchase intentions (Jaiswal et al., 2021; Shanmugavel & Micheal, 2022). Moreover, it was highlighted that consumers consider a product to be superior based on the relative product advantages that are different from one consumer to the other. Consequently, as discussed in (TRA) and (TAM) (Fred D. Davis et al., 1989), behavioural intention is positively correlated with actual use of technology.

Research Methodology

Sampling and procedures

Nonelectric vehicle owners were selected from Alexandria, Cairo, and Giza. The study adopted a single cross-sectional time horizon, where data collection took a period of 4 months through questionnaire. The questionnaire consists of 3 main sections: the first focuses on the possession of an electric vehicle and its attributes; the second section is a 5-point Likert scale for the research variables, and, finally, the third each section focuses on demographic information: age, gender, educational level, and income. Table (I) illustrates the items for each construct in the questionnaire.

Table (I) Conceptual and operational definition of the factors under investigation

Construct	Items
Perceived ease of use (Schlüter & Weyer, 2019)	PEU1-It is easy for me to learn how to use electric vehicle. PEU2-The operation of an electric vehicle is no different to me than that of a conventional vehicle. PEU3-It is difficult to drive an electric car PEU4-It is difficult to charge an electric car.
Perceived usefulness (Schlüter & Weyer, 2019)	PU1-Generally, electric vehicles will be useful in meeting my driving needs. PU2-An electric vehicle will increase my willingness to drive for my mobile routines. PU3-Electric vehicle are useful idea.
Perceived barriers (Degirmenci & Breitner, 2017)	PB1-There are not enough charging stations for electric vehicles. PB2-The range of electric vehicles is too low. PB3-The charging of electric vehicles takes too long. PB4-The infrastructure for electric vehicles needs to grow. PB5-You always have to charge electric vehicles quite frequently. PB6-You cannot charge electric vehicles at home. PB7-The battery technology of electric vehicles is insufficient.
Knowledge of electric vehicles (Dash, 2020)	KEV1-I have little knowledge of electric vehicles. KEV 2-I am not familiar with electric vehicles. KEV3-I have little experience of electric vehicles.

Construct	Items
Price sensitivity (Bhutto et al., 2020)	PS1-It is acceptable to pay more for electric vehicle than for normal vehicles. PS2-I am willing to pay more for electric vehicle than for normal vehicles. PS3-I can afford to spend extra money to an electric vehicle.
Environmental concern (Wang, Cao, & Zhang, 2021)	EC1-I think that environmental problems have become increasingly serious in recent years. EC2-I think that human beings should live in harmony with nature to achieve sustainable development. EC3-I do not think that we are doing enough to save scarce natural resource from being used up. EC4-I think that everyone has a responsibility to protect the environment.
Green Trust (Moon, 2021)	GT1-Electric vehicles' manufacturers' environmental commitments are generally reliable. GT2-Electric vehicles' environmental performances are generally dependable. GT3-Electric vehicle manufacturers' environmental arguments are trustworthy. GT4-Electric vehicle manufacturers keep the environmental promises and commitment they make.
Attitude to-wards electric vehicle (Dash, 2020)	AEV1-I believe that electric vehicles are a good choice. AEV2-I believe that electric vehicles are beneficial. AEV3-I believe that electric vehicles are attractive. AEV4-Government support for the widespread use of electric vehicles is wise. AEV5-My attitude toward electric vehicles is favourable.
Subjective Norms (Ko & Jin, 2017)	SN1-People who are important to me think I should purchase an electric vehicle. SN2-People who are important to me would approve of my purchasing electric vehicle. SN3-People who are important to me want me to purchase an electric vehicle.
Purchase Inten-tion (Ko & Jin, 2017)	PI1-I intend to purchase an electric vehicle. PI2-I plan to purchase an electric vehicle. PI3-I want to purchase an electric vehicle.

The study uses AMOS to analyze the collected data through deploying covariance based structured equation modelling. SEM is more robust than the normal data analysis methods as in the same model, one or more variables are measured using different indicators and then analysed to determine variables' interactions (Hair, Gabriel, & Patel, 2014). CB-SEM requires 5-10 observations per indicator (Nicolaou & Masoner, 2013); the sample size for the main test in this study is 543 and 207 for the pilot test, which falls in line with the rule of thumb 5-10. Data were collected using convenient sampling technique. Table (II) illustrates the demographic statistics for the participants in the main study.

Testing reliability and validity of the pilot test

To ensure face and content validity of the data collection instrument, a pre-test was carried out through consulting four practitioners and three academics. After the pre-test, a pilot study was conducted through collecting 207 valid questionnaires. Calculations of composite reliability (CR) and factor loadings reported values greater than 0.7 and 0.5, respectively. In addition, average variance extracted (AVE) for all variables ranges between 0.711 to 0.899, thus exceeding the suggested value of 0.5 (Bernardo, Marimon, & del Mar Alonso-Almeida, 2012). Items with factor loadings less than 0.5 were removed. Reliability and validity were calculated using CFA model Goodness-of-Fit, which was also calculated using Model fit indices: x2: 629.706, df: 546, P-value = 0.007, $\chi2/df$ = 1.15, RMSEA=0.027, TLI=0.979, CFI=0.982, GFI = 0.867, AGFI = 0.837. The values of the goodness fit indices indicate a good model fit (Riikkinen, Kauppi, & Salmi, 2017).

Table (II) A summary of respondents' demographic information

Demographic Variables	Criteria	Frequen-cy	Percent-age
Gender	Male	238	43.8%
	Female	305	56.2%
Age	18-22	130	23.9%
	23-27	99	18.2%
	28-32	100	18.4%
	33-37	47	8.7%
	38-42	108	19.9%
	46-50	7	1.3%
	Above 50	52	9.6%
Monthly income Egyptian bound	less than 5000	197	36.3%
	5001-10000	204	37.6%
	10001-20000	128	23.6%
	20001-30000	10	1.8%
	More than 30000	4	0.7%
Educational classifications	Undergraduate	130	23.9%
	Diploma	34	6.3%
	Bachelor degree	173	31.9%
	Postgraduate	206	37.9

Data analysis and results

Measurement model

Before carrying on with the hypothesis testing, non-response and common method bias were investigated. The t-test revealed no statistically significant differences between early and late respondents (Han & Huo, 2020). In addition, Harman's single factor test demonstrated that there is no single factor accounting for the majority of the variance when testing for common method bias (Mani & Gunasekaran, 2018).

A total of 617 questionnaires were distributed; however, only 564 were returned, and 21 of those were incomplete, which means that 543 were valid, with a response rate of 88.01%. The collected questionnaires were used to test for reliability and validity of the data collection instrument, using CR, factor loadings, AVE, and square root of AVE in order to extract discriminant validity. Based on the output in Tables (III) and (IV), it can be observed that all factor loadings are above 0.5; CR and AVE recorded values greater than 0.7 and 0.5, respectively (Bernardo et al., 2012). In addition, square root of AVE is greater than the correlation among the research variables (J. S. Wu & Law, 2019). Finally, the model fit indices Chi-square, degrees of freedom, RMSEA, TLI, CFI, GFI, AGFI and IFI confirm the goodness fit of the model (Riikkinen et al., 2017).

Structural model

Results of structural equation modelling indicated in figure 1 and Table (V) that PEU can significantly affect PI through AEV (β = 0.008, P = 0.023). This means that if individuals favor EV and people around them are encouraging them to purchase an EV, it is more likely that their perceived usefulness of EV will make them more willing to purchase an EV, which means that people around individuals can push them to purchase an EV if they believe that owning an EV is useful. Therefore, the H_1 is supported. Regarding the H_2 is rejected as the (β = -0.003, P = 0.681). This means that the individual's attitude to buy something will not affect individual's perspective gained value from the product. For the H_3, it can be observed that consumers' attitude towards electric vehicles mediates the relationship between perceived barriers and

Table (III) Factor loadings, composite reliability and AVE of the main study

Variable	Items	Factor loadings	Composite reliability	AVE
Perceived ease of use	PEU1	0.862	0.891	0.671
	PEU2	0.817		
	PEU3	0.812		
	PEU4	0.786		
Perceived usefulness	PU1	0.856	0.838	0.636
	PU2	0.869		
	PU3	0.650		
Perceived barriers	PB1	0.794	0.896	0.634
	PB2	0.835		
	PB3	0.823		
	PB4	0.860		
	PB5	0.656		
Knowledge of electric vehicles	KEV1	0.749	0.8415	0.639
	KEV2	0.780		
	KEV3	0.865		
Price sensitivity	PS1	0.839	0.889	0.729
	PS2	0.845		
	PS3	0.877		
Environmental concern	EC1	0.689	0.810	0.516
	EC2	0.720		
	EC3	0.745		
	EC4	0.721		
Green trust	GT1	0.699	0.814	0.523
	GT2	0.705		
	GT3	0.770		
	GT4	0.718		
Attitude towards electric vehicle	AEV1	0.856	0.869	0.626
	AEV2	0.830		
	AEV3	0.820		
	AEV4	0.642		
Subjective norm	SN1	0.661	0.786	0.552
	SN2	0.810		
	SN3	0.752		
Purchase intention	PI1	0.811	0.823	0.608
	PI2	0.784		
	PI3	0.743		

Model fit indices: x2: 1054.961, df: 662, P-value = 0.000, $\chi2/df$ = 1.59, RMSEA= 0.033, TLI= 0.952, CFI= 0.959, GFI = 0.913, AGFI = 0.892.

EV, which means that people around individuals can push them to purchase an EV if they believe that owning an EV is useful. Therefore, the H_1 is supported. Regarding the H_2 is rejected as the (β = -0.003, P = 0.681).

Table (IV) Assessing discriminant validity

VAR	PEU	PU	PB	KEV	PS	EC	GT0	AEV	SN	PI
PEU	(0.820)									
PU	0.118	(0.798)								
PB	0.065	0.056	(0.797)							
KEV	0.057	0.287	0.073	(0.800)						
PS	0.064	0.058	0.119	0.154	(0.854)					
EC	0.025	0.036	0.136	0.028	0.071	(0.719)				
GT0	0.025	0.012	0.035	0.040	0.029	0.176	(0.724)			
AEV	0.110	0.012	0.193	0.076	0.174	0.039	0.018	(0.792)		
SN	0.081	0.147	0.057	0.083	0.144	0.013	0.022	0.040	(0.744)	
PI	0.465	0.131	0.161	0.184	0.222	0.101	0.044	0.219	0.160	(0.780)

Note: square root of AVE is illustrated in the diagonal numbers between brackets

purchase intention as (β = -0.021, P = 0.005). This means that positive attitude towards EV can limit the negative impact PB on their purchase intention of EV. The H_4 is rejected as (β = 0.007, P = 0.219). This means that the attitude of the consumer will not affect the consumer's decision if they have enough knowledge about the EV. The H_5 is supported as

Table (V) Results of SEM

Direct	B	P-value	Decision	Indirect paths	B	P-value	Decision
				PEU -> AEV -> PI	0.008	0.023	Accepted
				PU -> AEV -> PI	-0.003	0.681	Rejected
				PB -> AEV -> PI	-0.021	0.005	Accepted
PI -> SN	0.118	0.002	Accepted	KEV -> AEV -> PI	-0.007	0.219	Rejected
				PS -> AEV -> PI	0.017	0.003	Accepted
				EC -> AEV -> PI	0.010	0.248	Rejected
				GT -> AEV -> PI	0.004	0.614	Rejected

Source: This research

(β = 0.0170, P = 0.003). This means that although the price has a huge impact on the PI, the attitude of the person could affect the final decision. The H_6 is rejected as (β = 0.010, P = 0.248). The H_7 is rejected as (β = 0.004, P = 0.614).

It is also important to mention that 4 control variables were used: gender, age, educational qualifications, and monthly income in the research model, and only educational qualifications was not significant.
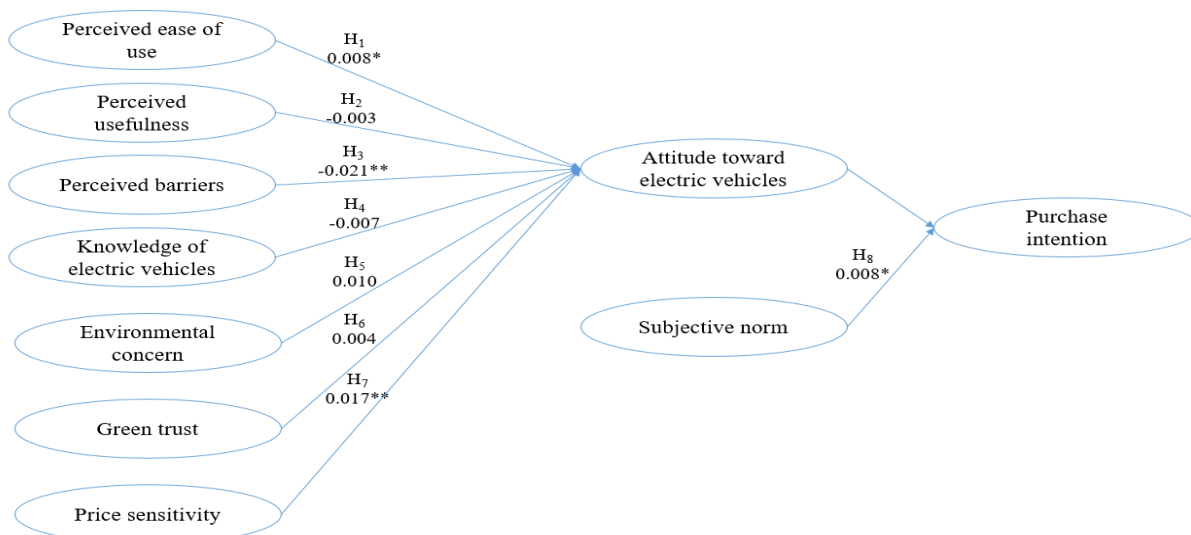
Note: **Means significance level at 1%.
* Means significance level at 5%.

Figure (1) the research model of the study

Discussion and Conclusion

Based on the previous analysis, the study indicated a significant relationship through attitude between perceived ease of use and intention toward buying the EV; this result is consisting with Wang, Tang, and Pan (2018), Schlüter and Weyer (2019), and J. Wu, Liao, Wang, and Chen (2019), especially in the context of developing EVs markets. It means that the ease of using EV will be reflect on the customer's intention to buy it. Regarding to perceived barriers, the study confirmed that perceived barriers have a positive impact on intentions through attitude. This results are consisting with Chen, Tsai, and Hsieh (2018), and Alkhalidi, Malkawi, and Amano (2021). However, Adhikari, Ghimire, Kim, Aryal, and Khadka (2020) empirically proved that perceived barriers can negatively influence individual's intentions towards EV. Results of previous studies also reported a contradiction with the results of the current study EV. Bhutto et al. (2020) investigated price sensitivity effect on consumer purchase intentions for hybrid-vehicles, and results revealed that price sensitivity can influence consumer purchase intentions. For the attitude, the research results is supporting the

customer attitude toward the intentions. The result is also partially supported by Dash (2020), where the empirical evidence proved that attitude towards electric vehicles can significantly influence a consumer's willingness to purchase electric vehicles. Kowalska-Pyzalska, Kott, and Kott (2021) and Dash (2020) found that knowledge of electric vehicles increases consumer willingness to use EV, which is not consistent with the current study as the study applied in emerging country. It could be needed some awareness about the EV. Dash (2020) concluded a positive effect of environmental concerns on the customer attitude towards electric vehicles. While Moon (2021) revealed that green trust has a significant moderating effect on the impact of attitude on the intention to purchase electric vehicles and has an insignificant moderating effect on subjective norm and perceived behavioural control. Previous studies simply examined customer environmental knowledge and attitude while they did not consider consumer knowledge of environmentally friendly products and green trust, which were indicated to be the two most important indicators of how environmentally conscious customers are (Flankegård, Johansson, & Granlund, 2023; Li et al., 2021; C.-S. Tan et al., 2017; Tanwir & Hamzah, 2020).

The results revealed that usefulness of EV can only be recognized and influence purchase intention of EV when people around individuals push them towards buying EV. Attitude towards electric vehicles can limit the negative impact of lack of infrastructure and charging challenges. Additionally, this study highlights the fact that individuals in the Egyptian market lack knowledge and understanding about green practices as perceived usefulness, environmental concern, and green trust did not have a significant direct impact on purchase intention. The study also stresses on the fact that in post COVID-19 era, the world is neglecting environmental laws, especially in Egypt where inflation and depreciation of the local currency force individuals to search only for the essentials and the lowest price. Finally, although the control variables: gender, age, educational qualifications, and monthly income are not the main concern of this study, age and educational qualifications had interesting results, as age was negatively affecting purchase intention, and educational qualifications is not significant. This means that younger generations are more likely to purchase an electric vehicle.

Regarding the direct effect of subjective norm, it has been found that subjective norm positively affects consumers' intention to purchase EVs. This result means that the individual decisions of buying EV come from the society pressure; in addition, the opinions of others heavily influence their purchasing decisions. This finding is consistent with earlier studies, such as La Barbera and Ajzen (2020), Kashif, Zarkada, and Ramayah (2018), and Kobylińska (2022).

Academic implications

The research provides new insights and additional knowledge. It will fill the research gap in the context of consumer psychology of EV adoption (Bhattacharyya & Thakre, 2021; Kim et al., 2023). TAM has been embraced and raised from a variety of views by numerous scholars, including Arias-Oliva, Pelegrín-Borondo, and Matías-Clavero (2019), and W. K. A. Tan and Sundarakani (2021) in adoption block chain technology, Pazvant and Emel (2018) behavioural Intentions toward new things. However, this research will contribute to academic research in several ways: extend the applicability of TAM to EVs through adopting different constructs; but, the study found that TAM basic variables is not enough (perceived ease of use and perceived usefulness) to measure the related variables that affect the customer intentions to buy EV. The findings of the study are expected to provide researchers with relevant factors that affect consumers' purchase intentions of electric vehicles. Also, this study emphasizes the relative factors that affect consumers' attitudes based on the cultural context of Egypt. Up to the researcher's knowledge, very few research studies were conducted on developing countries (Krishnan & Koshy, 2021; Mali et al., 2022), especially Egypt. This is because electric vehicles are still in their introduction stage in the product life cycle, as Egypt is still de-

veloping the adequate infrastructure required for the spread of electric vehicles all over the country (Abdel Wahed Ahmed & Abd El Monem, 2020).

Managerial implications

This study provides important practical implications for government and business strategy. Based on the study, it will be more effective for the government to subsidize EV to facilitate its adoption as consumers are price sensitive. Since consumers perceived EV as easy to use and have positive attitudes towards buying EV, the government should support this industry through the facilitation of production procedures and reduction of taxes since this industry is considered attractive to the Egyptian market. Research findings imply the importance of creating awareness of green trust and environmental concern that matches with Egypt vision 2030 sustainable development strategy. Identification of the factors that affect consumers towards buying electric vehicles will help electric vehicles' producers to establish effective marketing strategies that provide consumer-oriented offerings and increase their adoption. It is recommended for EV producers to implement gamification as a marketing tool to encourage consumers' engagement with EVs and enhance EV product knowledge and consumer awareness for an uptake of social behaviour change.

Limitations and future research

Despite the significant contribution made by the present study in the area of consumer behaviour towards electric vehicles, some elements should be considered: a cross sectional research design was adopted in this research, where collected data cannot resemble changes over time. It is recommended for future research to collect longitudinal data and examine consumer change in behaviour for the adoption of EV. Further research can extend our study by considering cultural values and consumer lifestyle in the adoption of EV in the Egyptian market.

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