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Middle East J. of Management

ISSN online: 2050-3644 - ISSN print: 2050-3636
https://www.inderscience.com/mejm

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DOI: 10.1504/MEJM.2025.10067500

Article History:

Received:	02 June 2023
Last revised:	17 August 2023
Accepted:	17 August 2023
Published online:	30 November 2024

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Abstract: This study aims to research factors influencing intention to purchase electric vehicles (EVs) in Malaysia. Malaysians still need to be convinced about buying EVs, although they know their benefits to the environment. This study used a quantitative survey to collect 200 responses and analysed the data using hierarchical multiple regression. The study result showed that personal attitude and functional values positively correlate with the intention to purchase electric vehicles. However, infrastructure readiness was not associated with the intention to purchase electric vehicles. Gender was found to be a quasi-moderator in the research model. This study provides essential information to the government, manufacturers, distributors, and importers about the factors that lead Malaysians to purchase electric vehicles. The government could use the findings of this study to develop plans to attract more Malaysians to purchase electric vehicles towards achieving a carbon-neutral nation by 2050.

Keywords: intention to purchase electric vehicles; personal attitude; functional values; infrastructure readiness; gender; Malaysia.

Reference to this paper should be made as follows: Ming, L.C., Ping, L.L. and Hee, O.C. (2025) 'Factors influencing intention to purchase electric vehicles in Malaysia', *Middle East J. Management*, Vol. 12, No. 1, pp.46–62.

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1 Introduction

The automotive industry contributes about 4% of Malaysia's GDP and has become ASEAN's third-largest automotive manufacturing industry (MIDA, 2021). Since 2014, Malaysia's automotive industry has introduced various energy-efficient vehicles (EEV) ranging from fuel-efficient vehicles, hybrid, EV, CNG, LPG, biodiesel, ethanol, hydrogen, and fuel cells (MIDA, 2021). The main reason for introducing EVs is the zero-emission carbon dioxide, which benefits the environment in terms of reducing air pollution (Bernama, 2022a, 2022b). However, the acceptance of electric vehicles (EVs) among Malaysians still needs to improve, according to the Malaysian Automotive Association (MAA) review. Only two units of electric cars were sold in 2018, and 278 units in 2021 (Shaun, 2023). However, the number increased to 2,631 units in 2022 and the sales percentage of EVs in Malaysia is just 0.38% of the 702,275 units of vehicles sold in 2022 (Shaun, 2023). The EV sales were relatively low compared with the global average of 2.7% (Shaun, 2023). This scenario may be caused by the high maintenance cost of the vehicle battery and the issues related to the infrastructure of EV charging stations in Malaysia (Daniel, 2021). Despite the growing awareness and promotion of EVs in Malaysia, the low usage rate of EVs may be due to personal attitudes and functional values of the cars (Iman and Zainuddin, 2011). Hence, there is a need to investigate factors that influence the purchase intention of EVs among consumers in devising effective strategies to encourage their uptake. Limited research has addressed the issues of EV usage among Malaysian consumers. Therefore, this study investigates the roles of personal attitudes, functional values, and infrastructure readiness in determining the intention to purchase EVs. To further explore the links between individual attitudes, functional values, and infrastructure readiness on intention to purchase EVs, this study also aims to investigate the moderating influence of gender.

2 Literature review and hypothesis development

2.1 Theoretical foundations

The theory of consumption values is a set of concepts that explain why consumers pick a product or a brand instead of others when they decide to purchase the product (Sheth et al., 1991). Five consumption values determine the consumers' behaviour on their purchase intention: functional, social, conditional, emotional, and epistemic. The five consumption values are distinct, relate in an additive way, and influence the decision in small amounts. Any one or all of the five consumption figures may have an impact on the decision. A first-time buyer of an EV, for instance, might receive functional values (convenience, quietness, and environmental friendliness), social values (friends are also purchasing an EV), emotional values (the consumer feels happy owning an EV), epistemic values (the novelty of purchasing an EV is enjoyable), and conditional values (infrastructure readiness) from their purchase of an EV. Therefore, based on the theoretical foundations above, personal attitudes (social, emotional, epistemic values), functional values and infrastructure readiness (conditional values) are used to establish the research model. In addition, gender schema theory supports the inclusion of gender as a moderator to identify any differences between how men and women perceive information and make decisions (Bem, 1981). Venkatesh and Morris (2000) asserted that men are more task oriented and likely to be motivated by achievement needs, whereas women are often motivated by relational and emotional needs. Therefore, gender is used to test if it has any moderating effects in the relationships between the personal attitudes, functional values, infrastructure readiness and intention to purchase EVs.

2.2 Intention to purchase EVs

Purchase intention measures how likely consumers are to make a future purchase of a certain good or service (Tajeddini et al., 2021). The purchase intent can help consumers to make efficient decisions before they purchase products or services (Yan and Hee, 2022). For example, companies can plan and manage their businesses if they can predict the consumer's intention to purchase their products soon (Misra and Dwivedi, 2022). Hence, it is vital to know Malaysia's intention to purchase EVs in the next five years to develop and apply strategies for EV sales.

The transportation sector has significantly contributed to environmental degradation, accounting for approximately one-fifth of greenhouse gas emissions globally (EEA, 2019). EVs have emerged as a viable solution to address the challenges posed by the scarcity of fossil fuels and environmental concerns, particularly regarding carbon dioxide emissions. EVs are seen as a promising solution to mitigate the environmental impacts of transportation and conserve non-renewable fuel resources throughout their life cycles (Liu et al., 2019). By decreasing dependence on fossil fuels and reducing air pollution, EVs can offer significant health and environmental benefits to urban transportation (Wu et al., 2020). When compared to conventional fuel-dependent vehicles, EVs can increase fuel economy by 40%–60% and reduce carbon dioxide emissions by 30%–50% (Liu et al., 2019). There have not been many research on Malaysian drivers to gauge public acceptability of and user intentions towards this developing technology because EVs are still a relatively new technology in the nation (Sang and Bekhet, 2015).

Malaysians need higher awareness and acceptance of green products (Mansor et al., 2014). Malaysian also needs to be more interested in solar panels and new green power supplies (Solangi et al., 2015). This scenario influences their interest in purchasing an electric vehicle (Rafia, 2013). Tanwir and Hamzah (2020) claimed that Malaysians have less intention to purchase EVs than other countries like the United States and Europe. The Malaysian Government has introduced incentives to create awareness among drivers. For instance, the government launched an initiative to achieve zero carbon by 2050 under the 12th Malaysia Plan (Drive, 2022). In conjunction with the zero carbon policy, EVs are exempted from import duties and excise taxes, making them more affordable for Malaysian under the Budget 2022. Despite the growing awareness and promotion of electric cars in Malaysia, a deeper understanding of consumer attitudes and behaviours toward EVs, especially personal preferences, functional values, and infrastructure readiness, is essential to address the low purchase intention of EVs in Malaysia.

2.3 Personal attitudes

Attitude is people's feelings, manner, position, and disposition. It is about a person's tendency or orientation, especially in mind. There are two types of attitudes: specific and general (Chen and Chai, 2010). General attitude is the tendency of an attitude object to engage in the proper activity, whereas specific attitude is described as a single behaviour on a specific item (Tan, 2011).

Attitude guides people in making decisions to purchase a product (Tajeddini et al., 2022). It influences the purchase decision according to the consumers' needs and wants. Nevertheless, consumers' attitudes will be influenced by news or people surrounding them before purchasing the product. For instance, consumers may seek opinions from others before they make decisions. According to previous studies, attitude influenced purchase intention and purchase decision with other factors like pricing, income, and product benefits (Iman and Zainuddin, 2011). However, rankings of the brands and models may also become measures that form part of the intention to purchase processes (Kotler and Armstrong, 2001). Rashid (2009) also stated that the intent to purchase green products depends on personal attitudes, especially when compared with conventional products. Therefore, based on the above discussion, it is hypothesised that:

H1 There is a significant positive relationship between personal attitudes and intention to purchase EVs.

2.4 Functional values

According to Sheth et al. (1991), functional values are the perceived benefits associated with an alternative's ability to do real-world tasks or serve other purposes. Functional values include selling price, maintenance cost, and quality cost. EVs' selling price will be the main concern for Malaysian purchasing an EV. The current EV selling price in the Malaysian market is between RM150,000 to RM700,000, which is unaffordable by most Malaysians, especially for the lower-income groups (Tham, 2022). Hence, most Malaysians prefer to purchase national cars like Proton and Perodua. They are cheaper than EVs, at least by one-third. The cost maintenance of EVs only needs a little maintenance cost except for the battery, which is the most expensive part to replace after 100,000 kilometres. The EVs' maintenance cost is 30% lower than traditional fuel-driven

vehicles (Mandavra, 2022). To maintain the quality and reliability of the electric vehicle's battery, the vehicle manufacturer should provide an 8–10 years warranty period for the battery system (Daniel, 2022).

Nevertheless, functional values also describe consumers' consideration of a product's price and quality (Sheth et al., 1991). According to Suki (2013), before consumers decide to purchase, they will consider the product's price and quality. In addition, consumers will also assess the product's performance, such as dependability, cost, reliability, durability, permanence, and quality, before making their purchase decisions (Chang et al., 2016). Therefore, functional values are crucial in determining purchase intentions because they are linked with the product values that ultimately influence consumers to adopt the product (Febransyah, 2021). Likewise, Wang et al. (2013) discovered that functional values were significantly related to purchase intention. Hence, it is hypothesised that:

H2 There is a significant positive relationship between functional values and intention to purchase EVs.

2.5 Infrastructure readiness

Electric vehicle infrastructures are all structures and equipment necessary to support electric vehicle operations, like battery charging stations and exchange stations. Charging stations are essential for drivers who use EVs. It is the same concept as the petrol stations where charging stations are essential for EVs, especially long-distance travel. Drivers need to charge their EVs after a long drive depending on the power of their battery capacity. The owners of EVs need help locating charging stations locally, which are still uncommon in Malaysia (Rahimi, 2020). It is learned that the number of public charging stations for EVs in Malaysia still needs to grow, where currently, it is less than 1,000 stations available nationwide (Anthony, 2022). Besides, EVs' drivers may be unable to charge their EVs at home due to the limited power supply capacity at 13 Amps. The EV's charger of a 7 kW, level 2, requires at least an input of 32 Amps power supply. Furthermore, the duration required to charge an electric vehicle fully may take longer hours than the usual fast charging system if the power supply is lower.

Nonetheless, by 2025, the Malaysian Government hopes to have 10,000 stations all around the country (Bernama, 2022b). This will provide more convenience to electric vehicle drivers to charge their EVs. It is also an excellent initiative to increase the sales of EVs in Malaysia, as highlighted by Sime Darby Limited. They expect the sales of EVs will increase two folds from the current sales volumes (Syafiqah, 2022). According to Browne et al. (2012), infrastructure readiness is significant in influencing the purchase intention of EVs. The availability of more charging stations will increase the demand for EVs (Silvester, 2013). In order to influence drivers' intentions to switch from their current petrol automobiles to EVs, infrastructure preparation is crucial. The following hypothesis is established in light of the discussion above:

H3 There is a significant positive relationship between infrastructure readiness and intention to purchase EVs.

2.6 Gender

Gender is intertwined with all aspects of behaviours, and gender greatly influences consumer intention to purchase behaviour. There are gender disparities in information processing and behavioural responses. Generally, there are clear variations between the ways that men and women empathise and systematise. Men are typically more cognitively overloaded than women are emotionally (Boron-Cohen, 2016). A study by Sovacool et al. (2019) examined the difference in gender in owning a vehicle. It was found that men tend to own a vehicle or EV more than women. Furthermore, Zhan (2022) also reported that gender significantly moderates the relationship between affective attitude and intention to buy a new EV. In order to better understand the links between personal attitude, functional values, infrastructure readiness, and intention to purchase EVs, this study looks at the moderating influences of gender. Given the rationale provided above, the following hypotheses are established:

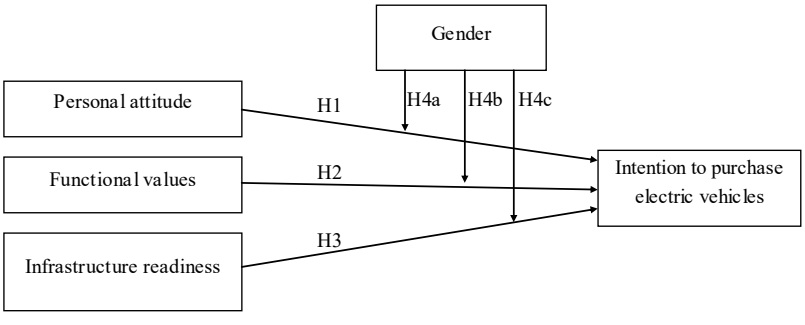
H4a Gender moderates the relationship between personal attitude and intention to purchase EVs.

H4b Gender moderates the relationship between functional values and intention to purchase EVs.

H4c Gender moderates the relationship between infrastructure readiness and intention to purchase EVs.

The following conceptual framework (see Figure 1) is established according to the above literature review and hypothesis development.

Figure 1 Conceptual framework



3 Research methodology

3.1 Population and sampling method

The target population for this study is Malaysians who are above 18 years old and possess valid driving licenses. Based on the G-Power sampling calculation, the minimum sample size required for this study is 119. To accurately represent the population, Levin and Rubin (1998) suggested that the samples will be of good quality and more representative of the population if they are collected to maximise the collection of certain

elements. Therefore, convenience sampling techniques were used in this study because this technique is convenient and effective and allows the researcher to generate more samples with less or no investment in a short period (Galloway, 2005). A total of 200 usable responses were successfully collected from the survey activities.

3.2 Research instruments

The measurement items of intention to purchase EVs (six items), personal attitude (11 items), functional values (ten items) and infrastructure readiness (five items) were adapted from the study of Norsam (2020). The survey questionnaire was assessed via a five-point Likert scale from '1-strongly disagree' to '5-strongly agree'. SPSS then analysed the collected data to derive hypothesis testing results for discussions.

3.3 Data collection procedure

Data collection of this study was conducted by employing a quantitative methodology. The hardcopies of the self-administered questionnaires were printed and distributed to the customers in an automotive business company. The researchers collected data from the respondents to determine their intentions to purchase EVs in the next five years. A duration of two months was allocated to collect the data. SPSS then analysed these data using factor analysis, reliability test, correlation analysis, hierarchical multiple regression analysis as suggested by Chyi and Hee (2022) for subsequent findings and discussions.

4 Results

4.1 Profile of the respondents

The demographic profiles of the respondents are depicted in Table 1. The survey has received a total of 200 responses. The respondents in this study comprised 103 males (51.5%) and 97 females (48.5%). The race of the respondents shows that most of the respondents are Chinese (n = 153, 76.5%), followed by Malay (n = 39, 19.5%), Indian (n = 6, 3%) and others (n = 2, 1%). The age group of 39–48 (n = 72, 36.0%) reported the highest number of respondents, followed by 29–38 (n = 56, 28.0%) and 18–28 (n = 41, 20.5%). As for the monthly income, most respondents had a monthly income of more than RM5,500 (n = 92, 46%), followed by the range of RM 2,501 – 4,500 (n = 35, 17.5%).

4.2 Factor analysis and reliability test

To verify the accuracy of the measurement tools, the factor analysis was carried out on each study variable. The factor analysis for this study used principal component analysis (PCA). The study variables in the research model were evaluated using the Bartlett's test of sphericity and the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO-MSA). As shown in Table 2, the value of KMO was 0.780 for intention to purchase EVs and the value of KMO was 0.885 for the three independent variables. A decent KMO score should be greater than 0.6, with Bartlett's test of sphericity significant at the 0.01 level,

according to Hair et al. (2005). The outcomes in Table 2 show that the correlation matrix's factorability was supported.

Table 1 Profile of the respondents

Description (n = 200)	*Frequency (n)*	*Percentage (%)*
Gender		
Male	103	51.5
Female	97	48.5
Race		
Chinese	153	76.5
Malay	39	19.5
Indian	6	3.0
Others	2	1.0
Age		
18–28 years old	41	20.5
29–38 years old	56	28.0
39–48 years old	72	36.0
49–59 years old	28	14.0
Above 59	3	1.5
Monthly income (RM.)		
< 2,500	30	15.0
2,501–3,500	35	17.5
3,501–4,500	18	9.0
4,501–5,500	25	12.5
Above 5,500	92	46.0

Table 2 KMO and Bartlett's test for all the study variables

Factorability assessment		*Intention to purchase electric vehicles*	*Independent variables*
Kaiser-Meyer-Olkin (KMO)	Measure of sampling adequacy	0.780	0.885
Bartlett's test of sphericity	Approx. Chi-square	298.436	1,464.292
	df	15	66
	Sig.	0.000	0.000

Table 3 shows the factor analysis for the intention to purchase EVs. All items indicating intention to buy EVs (B1, B2, B3, B4, B5, and B6) were put on a single factor, as shown in Table 3. The eigenvalue of 2.868 was over 0.50 for all factor loadings. 0.633 to 0.739 was the range of the loading values. The extracted indicators of intention to purchase EVs could explain 47.808% of the total variance.

The rotated component matrix for the independent variables is shown in Table 4. Three factors with loadings above 0.50 were retrieved using the PCA. Personal attitude (seven items), functional values (three items), and infrastructural readiness (two items) are the retrieved components. These three variables collectively explained 73.771% of

the total variance and have eigenvalues greater than 1.0. The factor loading values of the scale were in the range of 0.766 to 0.888. Items C8, C9, C10, C11, D1, D2, D3, D4, D5, D6, D7, E3, E4 and E5 were removed due to cross loadings.

Table 3 Factor analysis for the dependent variable of intention to purchase EVs

Items	*Description*	*Factor loading 1*
B1	I intend to purchase an electric vehicle because it is environmentally friendly	0.739
B4	I will play a significant part in helping the environment if I drive an electric vehicle.	0.734
B6	I intend to buy EVs in the next five years.	0.717
B3	I intend to purchase EVs over conventional cars when their product qualities are similar.	0.683
B2	I intend to purchase EVs even though they are more expensive than conventional vehicles.	0.633
B5	I feel more comfortable if I drive electric cars rather than conventional vehicles.	0.633
	Eigenvalue	2.868
	Percentage of variance explained	47.808
	Cumulative %	47.808

Table 4 Factor analysis for the independent variables

Items	*Description*	*Factor loading*		
		1	*2*	*3*
C3	I like electric vehicle because it is pleasant	0.884		
C4	I like electric vehicle because it is wise	0.868		
C2	I like electric vehicle because it is desirable	0.860		
C1	I like electric vehicle because it is good	0.841		
C5	I like electric vehicle because it is favourable	0.837		
C6	I like electric vehicle because it is enjoyable	0.816		
C7	I like electric vehicle because it is reliable	0.801		
D9	An electric vehicle is economical driving		0.826	
D10	Plug-in hybrid EVs consume less petrol		0.769	
D8	EVs will lower my maintenance cost		0.766	
E2	I would always be worried about running out of charge when driving an electric vehicle			0.888
E1	I would not purchase an electric vehicle if there were no public charging stations			0.865
	Eigenvalue	5.630	1.948	1.274
	Percentage of variance explained (%)	46.917	16.233	10.620
	Cumulative (%)	46.917	63,151	73.771

The reliability coefficients (Cronbach's alpha) for each dimension, including infrastructure readiness, personal attitude, functional values, and intention to purchase EVs, were reported at 0.779, 0.940, 0.743, and 0.743, respectively, in Table 5. As long as the Cronbach's alpha values were greater than 0.70, they were considered to be dependable (Hair et al., 2005).

Table 5 Reliability test

Study variables	*No. of items*	*Cronbach's alpha (α)*
B – intention to purchase electric vehicles	6	0.779
C – personal attitude	7	0.940
D – functional values	3	0.743
E – infrastructure readiness	2	0.743

4.3 Correlation analysis

The magnitude of a linear link between two continuous variables was assessed using the Pearson correlation. Table 6 displays the strength of the relationships between the research variables. According to the findings, personal attitude and intention to buy an electric car were significantly and positively associated (r = 0.585, p 0.01). Similarly, intention to purchase EVs (r = 0.390, $p < 0.01$) was also significantly and positively correlated with functional values. On the other hand, personal attitude (r = 0.399, $p < 0.01$) was significantly associated with functional values and functional values (r = 0.193, $p < 0.01$) were significantly and positively correlated with infrastructure readiness. However, the intention to purchase EVs (r = 0.080, $p > 0.01$) was found not to be significantly associated with infrastructure readiness, and personal attitude (r = –0.003, $p > 0.01$) was discovered not significantly correlated with infrastructure readiness.

Table 6 Pearson correlation analysis for the study variables

Study variables	*B*	*C*	*D*	*E*
B – intention to purchase electric vehicles	1			
C – personal attitude	0.585**	1		
D – functional values	0.390**	0.399**	1	
E – infrastructure readiness	0.080	-0.003	0.193**	1

Note: **correlation is significant at the 0.01 level (two-tailed).

4.4 Hierarchical multiple regression analysis

The outcomes of a hierarchical multiple regression analysis is shown in Table 7. The findings from model 1 show how the independent variables (personal attitude, functional values, and infrastructural readiness) relate to the intention to purchase EVs. The results of the moderating effects of gender on the association between the intention to purchase EVs and the independent variables are shown in models 2 and 3, respectively. Based on the results, model 1 was found significant (F value = 39.014, $p < 0.001$) with an R-square value of 0.374. It demonstrates that individual attitudes, practical values, and the present

state of the infrastructure can account for 37.4% of the variation in intention to purchase EVs. The intention to purchase EVs was positively and significantly correlated with two of the three independent variables. The two variables are personal attitude (β = 0.515, $p < 0.001$) and functional values ($\beta = 0.175$, $p < 0.001$). Hence, H1 and H2 are supported. On the contrary, infrastructure readiness (β = 0.048, $p > 0.001$) was not significantly related to the intention to purchase EVs. Hence, H3 was not supported.

Next, model 2 was found significant (F value = 31.950, $p < 0.001$), with an R-square value of 0.396. It shows that upon inclusion of gender as a moderator, the R-square value has increased by 2.2% (from 37.4% to 39.6%). It indicates that the additional 2.2% of the variance in intention to purchase EVs can be explained by the inclusion of gender. Therefore, gender can add to the model's explanatory power with an improved R-square value. Additionally, model 3 with the interaction variables, with an R-square value of 0.451, was determined to be significant (F value = 22.502, p 0.001). The R-square value has increased from 39.6% to 45.1%. An additional 5.5% of the variance in intention to purchase EVs can be explained by the interaction variable of gender. For model 3, the interaction effects between personal attitude (β = 0.306, $p < 0.05$) and functional values ($\beta = 0.185$, $p < 0.05$) and gender show positive and significant results at the 0.05 level. Hence, H4a and H4b are supported. However, infrastructure readiness (β = –0.111, $p > 0.05$) was discovered not significantly interacted with gender. Hence, H4c was not supported.

Table 7 Hierarchical regression analysis of gender (male/female) on the relationships between intention to purchase EVs and the independent variables

Model	*DV: Intention to purchase EVs*					*Results hypothesis*
	Unstandardised coefficients		*Standardised coefficients*	*t*	*Sig.*	
	B	*Std error*	*Beta*			
Model 1 (Independent variables)						
Personal attitude	0.417	0.050	0.515	8.329	0.000**	H1 Supported
Functional values	0.196	0.070	0.175	2.778	0.006**	H2 Supported
Infrastructure readiness	0.038	0.046	0.048	0.825	0.410	H3 Not supported
F value	39.014					
Sig.	0.000					
R^2	0.374					
Model 2 (Moderating variable)						
Personal attitude	0.357	0.054	0.441	6.591	0.000**	
Functional values	0.113	0.076	0.101	1.488	0.138	
Infrastructure readiness	0.042	0.046	0.052	0.918	0.360	
Gender	0.248	0.093	0.193	2.666	0.008**	
F value	31.950					
Sig.	0.000					

Note: *Significant at the 0.05 level: C: personal attitude; D: functional values; D: infrastructure readiness.

Table 7 Hierarchical regression analysis of gender (male/female) on the relationships between intention to purchase EVs and the independent variables (continued)

Model	*DV: Intention to purchase EVs*					*Results hypothesis*
	Unstandardised coefficients		*Standardised coefficients*	*t*	*Sig.*	
	B	*Std error*	*Beta*			
Model 2 (Moderating variable)						
R^2	0.396					
Model 3 (Interaction variables)						
Personal attitude	0.128	0.081	0.158	1.568	0.119	
Functional values	–0.072	0.102	–0.064	–0.708	0.480	
Infrastructure readiness	0.110	0.060	0.137	1.826	0.069	
Gender	0.317	0.091	0.247	3.491	0.001	
C_CxGender	0.351	0.107	0.306	3.277	0.001**	H4a Supported
D_CxGender	0.317	0.148	0.185	2.144	0.033**	H4b Supported
E_CxGender	–0.131	0.088	–0.111	–1.477	0.141	H4c Not supported
F value	22.502					
Sig.	0.000					
R^2	0.451					

Note: *Significant at the 0.05 level: C: personal attitude; D: functional values; D: infrastructure readiness.

5 Discussion

The statistical findings from the regression analysis demonstrated a significant and positive relationship between personal attitude and the intention to acquire EVs (β = 0.515, p 0.001). Obviously, Malaysians are interested in purchasing EVs. Nevertheless, Malaysians also know EVs have more benefits in preserving the environment, significantly reducing air pollution. Malaysians feel that it is wise to use electric cars in the future. This finding is consistent with previous studies by Norsam (2020), Adnan et al. (2018), and Nor Azila and Teoh (2016). This also shows that Malaysians have positive attitudes toward EVs and intend to purchase them soon. Hence, the government and sellers of the EVs should tap on the attitudes of the buyers especially in promoting the green and carbon free concepts to strengthen the buyers' beliefs for those who want to reduce emissions, reduce fuel costs, and drive nice vehicles.

This study shows that functional values ($\beta = 0.175$, $p < 0.001$) were significantly and positively associated with purchasing EVs. Although the expected selling price, maintenance cost and quality of the EVs are still unknown, Malaysians feel good about purchasing an electric vehicle based on its functional values. This finding is in line with previous studies by Febransyah (2021), Lin et al. (2010) and Lin and Huang (2012). They found that functional values significantly correlate to the purchase of EVs. Efforts should

come from the sellers and the government to promote the functional values of the EVs in terms of product's performance, such as dependability, cost, reliability, durability, permanence, and quality to convince the buyers in making decision to purchase EVs.

On the other hand, the intention to purchase EVs was not substantially associated with infrastructure readiness (= –0.002, $p > 0.05$). Malaysians feel that charging their electric vehicle in Malaysia is not an issue because they might charge their EVs at home or any place with charging ports where EVs are available in the country. Besides, the battery for EVs may last a few days before it must be recharged. Another plausible reason is that EVs can be recharged during nighttime and ready to be used again the next day. This finding is in line with a previous study by Sang and Bakhet (2015), where they postulated that public charging ports are not the first consideration by Malaysians. Therefore, to build 10,000 charging stations all around the country may be less beneficial in increasing the intention to purchase EVs.

Finally, the results of the moderated regression analysis showed that men considerably and favourably influenced the correlations between individual attitudes, functional values, and propensity to buy EVs. This result is in line with research by Zhan (2022), who discovered that men significantly moderate the association between affective attitude and intention to purchase an electric vehicle. Generally, females are more emotional and responsive than males when making decisions. Females experience more conflicts than males. Prieto and Caemmerer (2013) found that men are more likely than women to purchase new EVs and high-end autos. Thus, in the process of increasing the purchase intention of EVs, male buyers should be targeted in promoting the functional values, features and benefits of the EVs as male buyers have strong beliefs, affective attitude and realistic expectations on high-end autos which will drive them to own an electric vehicle.

6 Implications

6.1 Theoretical implications

This study integrates the theory of consumption values and gender schema theory to establish the conceptual framework. It contributes to the existing literature in finding significant factors that influence the purchase intention of EVs. In addition, despite the importance of gender in purchase intention, there remains a lack of evidence on the moderating effect of gender on the purchase intention of EVs. Hence, this study makes an essential contribution by using gender as a moderating variable in determining the significant differences between males and females when purchasing an electric vehicle. As there are many gender-stereotyped expectations of behaviours for males and females, males were found to be favourably influenced by the relationships between personal attitudes and functional values and intention to purchase EVs. Such behaviours may occasionally change, although men possess a more decisive affective attitude toward new technologies and high-end autos. Nonetheless, this study has added to the literature by providing empirical evidence on the current trend of behaviour intention to purchase EVs between males and females.

6.2 Practical implications

From the findings of this study, the Malaysian Government, electric vehicle manufacturers, distributors, and importers can understand more about the customer's purchase intention of EVs in Malaysia. They can plan according to the significant factors influencing Malaysian's purchase intention of EVs. The Malaysian Government should continue the duty exemption to attract more Malaysians to purchase EVs. When more Malaysians use EVs, it will benefit the country in achieving the government's zero carbon goal in 2050. Besides, the Malaysian government also can plan to provide more incentives, such as lower down the business tax for existing companies involved in electric vehicle businesses and tax exemption for new electric vehicle companies incorporated in Malaysia. This will benefit the manufacturers, distributors, and importers in their business setup and attract more overseas electric vehicle investors to Malaysia. Nonetheless, for ease of charging EVs, the Malaysian Government can build more electric vehicle charging stations, especially in the outskirt areas. This will positively influence the purchase intention of EVs among the rural Malaysian drivers. Further, developers should build more electric vehicle charging stations for the buyers in parking areas, especially within a housing premise. More promotions and advertisements are needed to create awareness of using EVs. Training is required to produce more experts in this area to design before and after-sales services for vehicle owners. Next, more information on EVs should be disseminated to potential buyers in the outskirt areas to expand the market of EVs.

7 Conclusions

In conclusion, the intention to buy an electric car significantly and positively correlates with Malaysians' personal views and functional values. It indicates that Malaysians depend more on their feelings and the vehicle's functional performance when purchasing EVs. In addition, males were found to moderate the relationship between personal attitude, functional values, and intention to purchase EVs. Therefore, more attention should be put on male drivers in promoting EVs to achieve sales targets. The study presents novel findings on gender as a prominent moderator in understanding significant factors influencing the purchase intention of EVs. It contributes to the formation of strategies in promoting the use of EVs in achieving the Malaysian Government's zero carbon goal in 2050.

8 Limitations and future research

There are some limitations in this study. Firstly, lack of outskirts respondents participating in the survey due to weak internet coverage. Hence, the findings of this study may only represent some of the driver population in the country. Second, not all the respondents are willing to answer the survey questionnaires, and they ignore the invitations. Third, respondents need to provide their feedback truthfully. It may affect the accuracy of the data analysis. Collecting data from rural respondents is recommended for future studies to improve the findings' generalisability. The researcher may consider

distributing the electronic questionnaires to the respondents via their family members, friends, and colleagues to encourage participation in the survey activity. Next, it is suggested to conduct the research using a mixed method to gain more insight into their intentions to purchase EVs.

References

Adnan, N., Nordin, S.M., Amini, M.H. and Langove, N. (2018) 'What makes consumers sign up for PHEVs? Predicting Malaysian consumer behavior in adopting PHEVs', *Transportation Research Part A: Policy and Practice*, July, Vol. 113, pp. 259–278.

Anthony, L. (2022) 'Still less than 1,000 EV charging stations in Malaysia, infrastructure development has to speed up – MOSTI', *Paul Tan Local News* [online] https://paultan.org/2022/09/29/still-less-than-1000-ev-charging-stations-in-malaysia-infrastructure-development-has-to-speed-up-mosti/ (accessed 2 January 2023).

Bem, S.L. (1981) 'Gender schema theory: a cognitive account of sex typing', *Psychological Review*, Vol. 88, No. 4, pp.354–364, https://doi.org/10.1037/0033-295X.88.4.354.

Bernama (2022a) 'Rising interest in electric vehicles in Malaysia', *The Malaysian Reserve* [online] https://themalaysianreserve.com/2022/04/15/rising-interest-in-electric-vehicles-in-malaysia/ (accessed 2 January 2023).

Bernama (2022b) 'Installation of 10,000 EV charging points on the track, 700 ready – ministry', *The Edge Markets* [online] https://www.theedgemarkets.com/article/installation-10000-ev-charging-points-track-700-ready-%E2%80%94-ministry (accessed 2 January 2023).

Boron-Cohen, S. (2016) 'Autism and the empathizing-systemizing (ES) theory', in Zelazo, P.D., Chandler, M. and Crone, E. (Eds.): *Developmental Social Cognitive Neuroscience*, pp.139–152, Psychology Press, London.

Browne, D., Margaret, O. and Brian, C. (2012) 'How barriers to alternative fuels and vehicles should be classified and potential policies to promote innovative technologies be evaluated', *Journal of Cleaner Production*, November, Vol. 35, pp.140–151.

Chang, H.H., Fu, C.S., Fang, P.W. and Cheng, Y.C. (2016) 'The effects of relationship maintenance and relationship investment on SST relationship performance', *Information Technology & People*, Vol. 29, No. 3, pp.496–526.

Chen, T.B. and Chai, L.T. (2010) 'Attitude towards the environment and green products: consumers' perspective', *Management, Sciences and Engineering*, Vol. 4, No. 2, p.27.

Chyi, C.S. and Hee, O.C. (2022) 'Linking service quality, guest satisfaction and length of stay to e-WOM: a study in the hotel industry of Singapore', *Middle East Journal of Management*, Vol. 9, No. 1, pp.44–63.

Daniel, S.F. (2022) 'Reality of electric car long term maintenance in Malaysia', *Drive Safe and Fast* [online] https://www.dsf.my/2022/06/reality-of-electric-car-long-term-maintenance-in-malaysia/ (accessed 2 January 2023).

Drive (2022) 'Perodua wants to make the most affordable EV to buy and own in Malaysia', *Malay Mail* [online] https://www.malaymail.com/news/drive/2022/02/04/perodua-wants-to-make-the-most-affordable-ev-to-buy-and-own-in-malaysia/2039493 (accessed 2 January 2023).

EEA (2019) *European Union Emission Inventory Report 1990 – 2011 under the UNECE Convention on long-Range Transboundary Air Pollution (LRTAP)*, EEA Technical Report No. 9/2019. Copenhagen, European Environment Agency [online] https://www.eea.europa.eu/data-and-maps/indicators/main-anthropogenic-air-pollutant-emissions/eea-2011 (accessed 2 January 2023).

Febransyah, A. (2021) 'Predicting purchase intention towards battery electric vehicles: a case of the Indonesian market', *World Electric Vehicle Journal*, Vol. 12, p.240, https://doi.org/10.3390/wevj12040240.

Galloway, A. (2005) 'Non-probability sampling', *Encyclopedia of Social Measurement*, Vol. 2, Elsevier, Amsterdam.

Hair, J.F., Black, B., Babin, B., Anderson, R.E. and Tatham, R.L. (2005) *Multivariate Data Analysis*, 6th ed., Prentice Hall, New York.

Iman, K.A.Q. and Zainuddin, Y. (2011) 'The impact of media exposure to intention to purchase green electronic products amongst lecturers', *International Journal of Business and Management*, Vol. 6, No. 3, pp.240–248.

Kotler, P. and Armstrong, G. (2001) *Principles of Marketing*, 9th ed., Prentice Hall, Inc., New Jersey.

Levin, R. and Rubin, D.S. (1998) *Statistics for Management*, Prentice Hall, New Jersey.

Lin, P., Hung, Y. and Wang, J. (2010) 'Applying the theory of consumption values to choice behavior toward green products', *2010 IEEE International Conference on Management of Innovation and Technology (ICMIT)*, IEEE, pp.348–353.

Lin, P.C. and Huang, Y.H. (2012) 'The influence factors on choice behavior regarding green products based on the theory of consumption values', *Journal of Cleaner Production*, Vol. 22, No. 1, pp.11–18.

Liu, K., Li, K., Peng, Q. and Zhang, C. (2019) 'A brief review on key technologies in the battery management system of electric vehicles', *Frontiers of Mechanical Engineering* Vol. 14, No. 1, pp.47–64.

Mandavra, M. (2022) *How Much do EV Owners Save in Service Costs Compared to ICEs? Hot Cars* [online] https://www.hotcars.com/how-much-ev-owners-save-in-service-costs-compared-to-ices/ (accessed 2 January 2023).

Mansor, N., Yahaya, S.N., Nizam, N.Z. and Hoshino, Y. (2014) 'Consumers' acceptance towards green technology in automotive industries in Malacca, Malaysia', *International Journal of Business Administration*, Vol. 5, No. 1, pp.27–30.

MIDA (2021) *Malaysia Auto Industry: Tapping on New Areas of Opportunities* [online] https://www.mida.gov.my/malaysia-auto-industry-tapping-on-new-areas-of-opportunities/ (accessed 2 January 2023).

Misra, V. and Dwivedi, S. (2022) 'The influence of traditional advertising determinants on young consumers' purchase decision', *Middle East Journal of Management*, Vol. 9, No. 2, pp.146–161.

Nor Azila, M.N. and Teoh, C.W. (2016) 'Assessing consumers' purchase intention: as hybrid car study in Malaysia', *The Social Science*, Vol. 11, No. 11, pp.2795–2801.

Norsam, M. (2020) *Consumption Values and Consumer's Attitude towards Intention to Purchase Electric Car among Malaysian Consumers*, PhD thesis, Universiti Utara Malaysia.

Prieto, M. and Caemmerer, B. (2013) 'An exploration of factors influencing car purchasing decisions', *International Journal of Retail & Distribution Management*, Vol. 41, No. 10, pp.738–764.

Rafia, A. (2013) 'Malaysian perception and attitude towards an electric vehicle', *2nd International Conference on Mechanical, Automotive and Aerospace Engineering (ICMAAE 2013)* [online] http://irep.iium.edu.my/30706/1/Paper_30136_-_Camera_ready.pdf (accessed 2 January 2023).

Rahimi, Y. (2020) 'EV market slows on low awareness, limited charging stations', *The Malaysia Reserve* [online] https://themalaysianreserve.com/2020/02/19/ev-market-slows-on-low-awareness-limited-charging-stations/ (accessed 2 January 2023).

Rashid, N.R.N.A. (2009) 'Awareness of eco-label in Malaysia's green marketing initiative', *International Journal of Business and Management*, Vol. 4, No. 8, pp.132–141

Sang, Y.N. and Bekhet, H.A. (2015) 'Exploring factors influencing electric vehicle usage intention: an empirical study in Malaysia', *International Journal of Business and Society*, Vol. 16, No. 1, pp.57–74.

Shaun (2023) *MAA: 19,988 Hybrids Sold in Malaysia Last Year, Up 162% from 2021* [online] https://www.wapcar.my/news/maa-19988-hybrids-sold-in-malaysia-last-year-up-162-from-2021-61398 (accessed 2 January 2023).

Sheth, J., Newman B. and Gross, B. (1991) 'Why we buy what we buy: a theory of consumption values', *Journal of Business Research*, Vol. 22, No. 2, pp.159–170.

Silvester, S. (2013) 'Exploring design scenarios for large scale implementation of electric vehicles: the Amsterdam Airport Schiphol case', *Journal of Cleaner Production*, June, Vol. 48, pp.211–219.

Solangi, K.H. et al. (2015) 'Social acceptance of solar energy in Malaysia: users' perspective', *Clean Technologies and Environmental Policy*, Vol. 17, No. 7, pp.1975–1986.

Sovacool, B.K., Kester, J., Noel, L. and Rubens, G.Z. (2019) 'Are electric vehicles masculinized? Gender, identify and environmental values in Nordic transport practices and vehicle-to-grid (V2G) preferences', *Transportation Research Part D: Transport and Environment*, July, Vol. 72, pp.187–202.

Suki, N.M. (2013) 'Green awareness effects on consumers' purchasing decision: some insights from Malaysia', *International Journal of Asia Pacific Studies*, Vol. 9, No. 2, pp.49–63.

Syafiqah, S. (2022) 'Sime Darby aims for higher electric vehicle sales', *The Edge Markets* [online] https://www.theedgemarkets.com/article/sime-darby-aims-higher-electric-vehicle-sales (accessed 2 January 2023).

Tajeddini, K., Gamage, T.C., Hameed, W.U.I., Gretel, Q-M., Chaijani, M.H., Rasoolimanesh, S.M. and Kallmuenzer, A. (2022) 'How self-gratification and social values shape revisit intention and customer loyalty of Airbnb customers', *International Journal of Hospitality Management*, January, Vol. 100, p.103093, https://doi.org/10.1016/j.ijhm.2021.103093.

Tajeddini, K., Rasoolimanesh, S.M., Gamage, T.C. and Martin, E. (2021) 'Exploring the visitors' decision-making process for Airbnb and hotel accommodations using value-attitude-behavior and theory of planned behavior', *International Journal of Hospitality Management*, July, Vol. 96, p.102950, https://doi.org/10.1016/j.ijhm.2021.102950.

Tan, B.C. (2011) 'The roles of knowledge, threat and PCE on green purchase behavior', *International Journal of Business and Management*, Vol. 6, No. 12, pp.14–27.

Tanwir, N.S. and Hamzah, M.I. (2020) 'Predicting purchase intention of hybrid electric vehicles: evidence from an emerging economy', *World Electric Vehicle Journal*, Vol. 11, No. 2, p.35.

Tham, S.Y. (2022) *Electric Vehicles in Malaysia: Moving Uphill from Niche to Mass Market*, *Fulcrum*, Analysis of Southern Asia [online] https://fulcrum.sg/electric-vehicles-in-malaysia-moving-uphill-from-niche-to-mass-market/ (accessed 2 January 2023).

Venkatesh, V. and Morris, M.G. (2000) 'Why don't men ever stop to ask for directions? Gender, social influence and their role in technology acceptance and usage behavior', *MIS Quarterly: Management Information Systems*, Vol. 24 No. 1, pp.115–136, https://doi.org/10.2307/3250981.

Wang, H.Y., Liao, C. and Yang, L.H. (2013) 'What affects mobile application use? The role of consumption values', *International Journal of Marketing Studies*, Vol. 5, No. 2, pp.11–22.

Wu, H., Xu, L, Ren, S and Hao, Y. (2020) 'How do energy consumption and environmental regulation affect carbon emissions in China? New evidence dynamic threshold panel model', *Resources Policy*, August, Vol. 67, p.101678.

Yan, L.S. and Hee, O.C. (2022) 'The consumer purchase decisions of smartphones: empirical evidence from Malaysia', *Middle East Journal of Management*, Vol. 9, No. 3, pp.247–264.

Zhan, Q. (2022) 'What predicts intention to purchase new energy vehicles between males and females in China: using the extended theory of planned behavior', *Proceedings of the 2022 6th International Seminar on Education, Management and Social Sciences (ISEMSS 2022)*.