RESEARCH ARTICLE

▪ Vol. 5, No. 2 (Spring 2024)
▪ Pages: 154 – 161
▪ p-ISSN: 2791-0245
▪ DOI: 10.55737/qjssh.591349398
▪ e-ISSN: 2791-0229

Open Access

QLANTIC JOURNAL OF SOCIAL SCIENCES AND HUMANITIES

Electric Vehicle Adoption: The Nexus of Knowledge, Perceived Usefulness, and Ease of Use

Sajjad Hussain [1] Imran M. Qureshi [2]

Abstract: *The current study explores the relationships between individuals' level of knowledge about EVs, perceived usefulness, perceived ease of use and intention to buy EVs. The study utilized data collected from 277 participants selected using a purposive sampling technique. Results of the study show that knowledge about EVs positively impacts perceived usefulness and perceived ease of use. This can positively affect people's intention to adopt EVs as an eco-friendly means of transportation. The study also suggests the need to design awareness programs to improve the opinion and experience of users with EVs. The study suggests the use of experimental designs and longitudinal research to further explore the causality across different cultures using a more diverse data set. In this way, the study provides insights into the consumer's decision-making process regarding EVs and thus helps contribute to the establishment of an eco-friendly transportation system.*

Key Words: Intention to Buy EVs, Knowledge about EVs, Perceived Ease of Use, Perceived Usefulness

Introduction

Climate change has been the talk of the town for quite some time. The largest contributor to climate change/ global warming is the CO2 emissions resulting from the use of fossil fuels (Perera & Nadeau, 2022). The transportation sector, being the largest consumer of fossil fuels, needs to shift towards sustainable practices, especially through the use of electric vehicles. Using electric vehicles would greatly reduce the carbon footprint of the transport sector (Alibašić, 2022). Electric vehicles are the most lucrative solution to the problem of global warming as they rely on clean, renewable energy, which removes the negative consequences to the environment (David & Giordano-Spring, 2022).

Pakistan is among the countries that have faced the consequences of climate change with seasonal shifts, longer periods without rain and then floodings due to excessive rainfalls at other times. This makes the shift from combustion engine vehicles to EVs even more crucial for the country. Additionally, this would also help reduce the dependence on oil and allow the economy to recover as well (Hussain, 2022). Despite the overwhelmingly crucial arguments in support of EVs, not much work has been done to understand the purchase decision process of end users.

As EVs are an innovative technology specifically aimed to solve the environmental crisis, it is important that people perceive it as such (Schwedes et al., 2013). EVs are recognized to be the most viable solution to reducing CO2 emissions from the transport sector, and (International Energy Agency, 2018) it is important that they be presented as such to the public. Despite its advantages, EV adoption is still minimal in developing and underdeveloped countries (Stern, 2011; Kastner & Stern, 2015). Wolske and Stern (2018) attribute to varying factors, lack of knowledge about EVs and how they can solve not just the environmental crisis but also be an overall feasible solution at individual levels is one of the most prevailing factors that hinder EV adoption.

The Technology Acceptance Model (TAM), developed by Davis (1989), is a very useful framework in this regard. TAM suggests that acceptance and adoption of any new technology depend on the usefulness and ease of use of the technology perceived by potential users. Attribution of adoption of technology to perceived usefulness and perceived ease of use of technology was the major turning point. Perceived

[1] PhD Scholar, Faculty of Management Sciences, International Islamic University, Islamabad, Pakistan.
[2] Assistant Professor, Faculty of Management Sciences, International Islamic University, Islamabad, Pakistan.

▪ **Corresponding Author:** Sajjad Hussain (sajjad43h@gmail.com)
▪ **To Cite:** Hussain, S., & Qureshi, I. M. (2024). Electric Vehicle Adoption: The Nexus of Knowledge, Perceived Usefulness, and Ease of Use. *Qlantic Journal of Social Sciences and Humanities, 5*(2), 154-161. https://doi.org/10.55737/qjssh.591349398

usefulness (PU) is the perception of a person that a specific technology will enhance their ability to perform certain tasks. Perceived ease of use (PEOU), on the other hand, is the perception of how simple and seamless the technology will be to use (Malatji, Van Eck, & Zuva, 2020). The greater the perception of usefulness and ease of use of a technology, the more inclined people will be to use that technology (Rezvani et al., 2015).

The current study will utilize TAM in the context of EVs and will explore how the PU and PEOU of EVs are impacted as people's knowledge about EVs increases. This study is of major significance for developing countries, where people have little disposable income, as it tries to understand the decision-making process of a sensitive audience. This makes it even more important to educate people on the aspects of EV that relate to the value function (PU and PEOU). In this way, the study will offer valuable insights for marketers and companies in developing countries as to how they should go about introducing EVs and which characteristics they need to highlight in their efforts to increase EV adoption.

Literature Review

Technology Acceptance Model

TAM is a very useful framework when it comes to understanding the process of adoption of new technologies. TAM was initially proposed by Davis (1989) and was later on developed and refined by other researchers to produce TAM2 and TAM3. Davis (1989) believes that people's perception is that they're certain technology is going to make their lives easier and help them be more efficient in their tasks, which is crucial to how willing people will be to adopt the technology. Although TAM was initially developed for information systems, it was later on adapted into various fields, which include e-commerce (Kim et al., 2004) and healthcare (Holden & Karsh, 2010). The current study uses TAM to explain the process of adoption of electric vehicles by exploring the impact of the knowledge that people possess about electric vehicles and how it impacts their perception of the usefulness and ease of use of EVs.

Knowledge about Electric Vehicles and Perceived Usefulness

The knowledge that people possess about something greatly influences the attitudes and opinions they hold of them. If people have more knowledge about a tool or program, they're more likely to find it useful. According to Gnann et al. (2018), "Knowledge about Electric Vehicles refers to an individual's understanding and awareness of the technology, infrastructure, and environmental impact of electric vehicles. It includes knowledge about the benefits and limitations of electric vehicles, as well as knowledge about the charging infrastructure, battery technology, and other relevant factors". "Perceived Usefulness is a person's evaluation of how helpful a good or service is in helping them achieve their goals" (Davis, 1989). A great deal of empirical evidence supports the notion that knowledge about EVs positively impacts how useful they are perceived by people.

Huang et al. (2021) have stressed that in order to increase the perception of the usefulness of EVs, it is important to make people aware of their benefits with regard to the environment as well as individual users. Those with higher levels of knowledge of electric vehicles and their importance for the environment and benefits such as cost reduction, convenience, and less maintenance tend to have a favourable disposition towards EVs (Huang et al., 2021). A study by Wang et al. (2018) shows that people with higher levels of EV knowledge believe them to be eco-friendly. The study also shows that as knowledge about EVs increased, people regarded them as more convenient and economical.

H1: Knowledge about EVs has a positive and significant impact on Perceived Usefulness.

Knowledge about EVs and Perceived Ease of Use

Davis (1989) describes PEOU as "Perceived Ease of Use is the degree to which a person believes that using a particular system would be free from effort" This refers to how easy a certain technology is to adopt and operate with. Several studies show a positive impact of EV knowledge on PEOU. Wang et al. (2018) show that people's understanding of EVs was critical to their perception of how easier their lives will be upon adoption of EVs. A study by Huang et al. (2021) shows that as individuals' knowledge about operations,

assistance and infrastructure (charging stations especially) increased, they started to feel that EVs would make their lives easier and that it'd be easier to shift to EVs.

Wang et al. (2018) also stated that designing educational and awareness campaigns to enhance the understanding of people about EVs greatly affects how people perceive their convenience of usage. Hence, the adoption of EVs as a sustainable means of transportation will be impacted (Krishnan & Koshi, 2021).

H2: Knowledge about EVs has a positive and significant impact on Perceived ease of use.

PU (Perceived usefulness) and Intention to buy EVs:

The Technology Acceptance Model (Davis, 1989) states that the perception of the usefulness of a technology greatly influences the person's intention to use that technology. Jia et al. (2018) describe PU in the context of EVs as how beneficial, dependable and practical EVs are perceived to be by the users. Krishnan and Koshi (2021) also contend that the perception of usefulness directly translates into technology adoption. The dependence of the adoption of technology on its perception of usefulness is well established in previous studies as well (Baker-Eveleth & Stone, 2015; Stone & Baker-Eveleth, 2013). A significant relationship was found between PU, intention and behaviour in a study conducted by Fazel (2014). Another study by Wu et al. (2019) also observed that people's willingness to purchase EVs increased in accordance with PU. Another study with a Chinese sample also showed that the interest of respondents in buying EVs increased as PU increased (Chen et al., 2016). Faria et al. (2019) found a relationship between the PU of EVs and customers' intentions to buy.

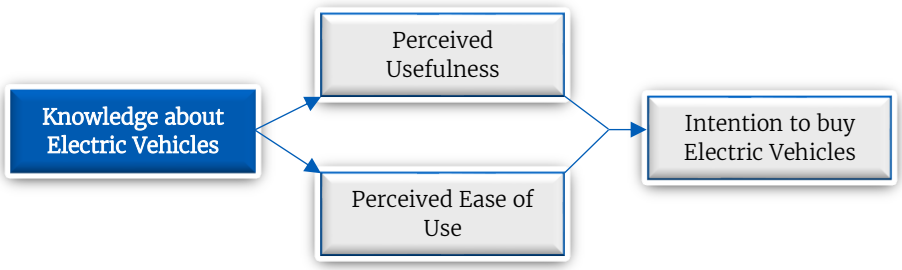
H3: Perceived Usefulness has a significant and positive impact on Intention to buy EVs.
H4: Perceived Usefulness mediates the relationship between knowledge about EVs and Intention to buy EVs.

Perceived Ease of use and Intention to buy EVs

Numerous researchers have studied the relationship between perceived ease of use and the intention to buy EVs. Ho et al. (2014) found a statistically significant relationship between PEOU and intention to buy EVs. Another study by Sierzchula et al. (2014) also found that the PEOU of customers had a significant impact on the purchase intention for EVs. Mousazadeh et al. (2018) found that the intention to buy electric vehicles increased alongside their perceived ease of use. Wang et al. (2018) state that the simplicity associated with technology affects both the adoption of and satisfaction with technology. Earlier studies have also identified various elements that are critical to the usability of electric vehicles. Liao, Molin, and Van Wee (2017) argue that factors like cost structures, driving range of vehicles, availability of charging infrastructure and the time it takes to charge are crucial to the perception of ease of use as well. Dimitropoulos et al. (2013) argue that it is important to have public charging infrastructures to convince users about the ease of use of EVs and driving adoption. The study further argues that families' decision on which car to buy is dependent upon the perception of simplicity and seamless adoption and use of those vehicles. A number of variables, including price, range, and infrastructure for charging, affect how user-friendly electric cars are. The results of the research show that the availability of public charging infrastructure has a major impact on convenience, which in turn influences adoption intentions.

H5: Perceived ease of use had a significant and positive impact on the Intention to buy EVs.
H6: Perceived ease of use mediates the relationship between knowledge about EVs and Intention to buy EVs.

Theoretical Framework



Methodology

Following a positivist approach, a survey research design was used to collect data cross-sectionally. The unit of analysis of the study was individuals, and data was collected in a non-contrived environment. A purposive sampling technique was used to collect data from the owners of 1800cc and above vehicles in Pakistan. The sample size of the current study was 277, who were presented with a survey consisting of validated items adapted from previous studies. A four-item scale was used to measure the intention to buy EVs based on the study of Dodds, Monroe, and Grewal (1991). Perceived usefulness was measured using a scale from the study of Bobeth and Kastner (2020). PU scale consisted of 3 items. Perceived ease of use was measured using a scale adapted from the study of Segars and Grover (1993). The scale for PEOU consisted of 4 items. In order to measure the knowledge about EVs, the study utilized the scale developed by Ullah, Robledo, and Wang (2018), as reported by Huang et al. (2021). The scale consisted of 4 items. The reliability of Cronbach's alpha was evaluated, and the validity of the scales was established before proceeding with analysis. Because SEM is a suitable method for multivariate data analysis, it was the main data analysis methodology used in this work.

Results

Table 1 lists the demographic details of a sample of 277 people, including age, gender, family income, and level of education. Men made up 67.8% of the participants, which was the majority. Similarly, 67.5% of the participants in the sample were between the ages of 26 and 35, which is a sizable fraction. Moreover, 39.7% of the subjects were bachelor's degree holders. The largest percentage of income earners, or 69.7% of the sample, were in the Rs 250K–Rs 499K income category. Furthermore, a smaller proportion of people—roughly 11.6%—reported making between Rs 750K and Rs 1 million.

Table 1

Demographic Characteristics	Frequency	(%)	Cumulative (%)
Gender	277		
Male	187	67.8	67.8
Female	89	32.2	100
Age	277		
26-35	187	67.5	67.5
36-45	41	14.8	82.3
46-55	27	9.7	92.1
Greater than 56	22	7.9	100
Education	277		
Intermediate	95	34.3	34.3
Bachelor	110	39.7	74
Master	65	23.5	97.5
PhD	7	2,5	100
Household Income (Monthly)	277		
Less than 250K	5	1.8	1.8
250K-499K	193	69.7	71.5
500K-749K	11	4	75.5
750K-1 million	32	11.6	87
Greater than 1 million	36	13	100

Measurement Model

The study employed PLS-SEM (a variance-based partial least squared structural equation modelling) as it does not require assumptions related to the distribution of data. The study examined the minimum and maximum values to assess the quality of data which fell within the acceptable range. The normality of data was confirmed using skewness and kurtosis, which fell within the acceptable range of -2 and +2, thus establishing the normality of data. The study measured the reliability and validity using composite reliability and average variance extracted as per the recommendations of Hair et al. (2019). For composite

reliability, the minimum observed value was 0.89, which is well above 0.7 (the minimum threshold for CR), while the value for AVE was above the minimum acceptable value of 0.5. Discriminant validity for the study was assessed using HTMT criteria, and all the constructs had values less than 0.9, which is in accordance with Heseler et al. (2015). Lastly, the structural model was assessed, and its values, along with Cronbach's alpha and correlations, are given in Table 3.

Table 2

Measures	No. of Items	OL (range)	CR	AVE
KEV	4	0.801-0.887	0.918	0.736
PU	3	0.837-0.9	0.910	0.771
PEOU	4	0.773-0.811	0.872	0.631
ITBEV	4	0.799-0.84	0.892	0.675

OL=Outer loadings, CR=Composite reliability and AVE=Average variance extracted

Table 3

	I	II	III	IV
KEV	(0.88)			
PU	.271**	(0.85)		
PEOU	.331**	.243**	(0.80)	
ITBEV	.314**	.466**	.276**	(0.83)

** Correlation is significant at the 0.01 level (2-tailed). Cronbach's Alpha values are given in parenthesis diagonally.

Structural Model

The structural model's effectiveness was measured in accordance with Hair et al. (2019), and a number of quantitative metrics (R2, effect size (f2), t-values, and out-of-sample prediction) were used for this purpose. Bootstrapping with 5000 iterations was used to calculate the t-values. Results show a positive impact of knowledge about EVs and perceived usefulness with a P value <0.001 and a beta coefficient of 0.272. Knowledge about EVs also had a positive impact on perceived ease of use, with a P value of 0.001 and a beta coefficient of 0.334. The impact of perceived usefulness on intention to buy EVs was found significant with a p-value of 0.001 and a beta coefficient of 0.424, while the impact of perceived ease of use on intention to buy EVs was significant with a p-value of 0.001 and a beta coefficient of 0.178. Results for direct relationships are shown in Table 4. Table 5 shows the mediation effects where the perceived usefulness mediated the relationship between knowledge about EVs and intention to buy EVs with a value of 0.115, and the perceived ease of use mediated the relationship between knowledge about EVs and intention to buy EVs with a value of 0.06.

Table 4

Hypothesis	Relationships	ß	SE	t-values	F^2	R^2	Q^2	Decision
H1	KEV→PU	0.272	0.25	4.867***	0.265	0.433	0.280	Accepted
H2	KEV→PEOU	0.334	0.24	3.964***				Accepted
H3	PU→ ITBEV	0.424	0.35	7.582***				Accepted
H5	PEOU→ ITBEV	0. 178	0.27	6.113***				Accepted

Notes: ***p < 0.001, KEV= Knowledge about electric vehicles , PEOU= Perceived ease of use, PU= Perceived usefulness, ITBEV= Intention to Buy Electric Vehicles

Table 5

Outcome	Standardized coefficient (ß)	SE	Bootstrapping 95% CI		Decision/Results
			Lower limit	Upper limit	
Indirect effects					
H4: KEV→PU→ ITBEV	0.115	0.233	0.051	0. 178	Accepted
H6: KEV→PEOU→ ITBEV	0. 060	0.219	0.025	0.095	Accepted

Notes: ***p < 0.001, KEV= Knowledge about electric vehicles , PEOU= Perceived ease of use, PU= Perceived usefulness, ITBEV= Intention to Buy Electric Vehicles

Discussion and Conclusion

Discussion

The current study focused on the impact of knowledge about electric vehicles on perceived ease of use and perceived usefulness and how this affected their intention to purchase EVs. The study hypothesized a positive and significant impact of knowledge of electric vehicles on their perception of the usefulness of EVs (Huang et al., 2021). If consumers believe that EV usage can better their lives and help them lead better lives, they will be more willing to use EVs. This perception of usefulness can be enhanced if they are well-informed about EVs and their positive impacts on users' individual lives and their environment (Wang et al., 2018). Providing proper knowledge of EVs can go a long way in reducing people's worries about the range, charging lifespan, and battery life, which can help increase the positive effects of electric vehicles and thus contribute to their acceptance.

The positive impact of perceived usefulness on the intention to buy EVs, as observed in the current study, is in line with the study of Jia et al. (2018). If people believe that using EVs adds an overall value to their lives, they will be more likely to shift to electric vehicles (Krishnan & Koshi, 2021). Electric vehicles have a lot of benefits ranging from cost-cutting and low dependence on fuel, and they are much more sustainable with regard to the environment. Knowledge of these benefits increases customers' attitudes and beliefs towards EVs, which drives adoption (Stone & Baker-Eveleth, 2013).

The current study supports the notion that the perception of ease in terms of usage of electric vehicles influences how willing people would be to adopt electric vehicles (Mousazadeh et al., 2018). The friendliness of EVs in terms of their usage depends on the availability of support services, controls and provision of charging infrastructure (Liao, Molin, & Van Wee, 2017). Sierzchula et al. (2014) state that the positive perception regarding the ease of usage reduces the negative schemas associated with technology, and doing so will make it more appealing to purchase electric vehicles.

Limitations and Future Directions

The study has several limitations as well. Since the data collected for analysis in this study was collected from Pakistan only, this indicates a sampling bias, making it less generalizable to other cultures and regions, especially the developed nations where the infrastructure is much better, and people have more disposable income. Future studies can include participants from diverse backgrounds and varying regions to establish the generalizability of results. This study used self-reported questionnaires to collect data from participants, who are prone to biases as people tend to respond in a socially desirable manner. Another limitation of the study is the use of a cross-sectional collection of data, which limits the study to intention and cannot incorporate actual behaviour. Future studies can employ longitudinal design to collect data at different points in time and may even explore actual purchase behaviour. Future studies may also incorporate societal standards, concerns about the environment, and perceptions of economic conditions.

Implications

The study holds significant implications for academia as well as industry. The study extends TAM to the context of electric vehicles to study purchase intention and how knowledge about technology affects intention. The inclusion of knowledge about EVs is significant as it provides a mechanism to increase the perceived usefulness and ease of use of EVs, which was previously missing. The study informs practitioners about the need to design awareness programs for consumers to increase their knowledge about how EVs will not just be another cost that they'll have to bear. Rather, EVs are a solution to a wide range of their problems as it will reduce their dependency on fossil fuels, which will reduce their cost while solving a greater concern of global warming, which is a threat to not just the current generation but its impacts on generations to come will be even more severe. The study also informs policymakers and governments about the need to mobilize resources like support mechanisms and charging stations to drive people to adopt EVs in a seamless manner.

Conclusion

The main goal of this study was to investigate the connections between people's perceptions of electric

vehicles. (EVs'), PU, PEOU and their intention to buy EVs. Significant information on the factors influencing consumers' propensity to adopt sustainable transportation options has been gained from the research. Our study's findings support the idea that customers' opinions on the usefulness and user-friendliness of electric cars (EVs) are greatly influenced by their knowledge of EVs. People will be more inclined to consider electric vehicles (EVs) as viable and attractive alternatives to traditional internal combustion engine vehicles as they become more knowledgeable about EV technology, charging infrastructure, and operational factors. Gaining this additional knowledge fosters a positive attitude toward electric cars (EVs), highlighting their potential benefits in terms of reduced environmental impact, lower operating costs, and increased customer happiness. The study results additionally indicate a significant and positive correlation between the perceived utility of electric vehicles (EVs) and the propensity to purchase them. Customers who consider electric cars (EVs) to be highly useful are more likely to consider utilizing them as their primary mode of transportation. Electric vehicles (EVs) are seen favourably by consumers who value environmentally friendly and sustainable transportation options because of their perceived advantages, which include possible cost savings and environmental friendliness. Similarly, customers' tendency to purchase electric vehicles (EVs) is positively influenced by how easy they believe them to be to use. People are more likely to get past their fears about embracing new technology when they believe that electric cars (EVs) are simple to operate, have abundant charging infrastructure, and have intuitive controls. Enhancing the usability and user experience could significantly increase customer acceptance and adoption of electric cars (EVs).

References

Ajzen. I., & Fishbein, M. (1980). *Understanding Attitudes and Predicting Social Behavior*. https://ci.nii.ac.jp/ncid/BA21965086

Alibašić, H. (2020). The administrative and ethical considerations of climate resilience: The politics and Consequences of climate change. *Public Integrity*, *24*(1), 33–50. https://doi.org/10.1080/10999922.2020.1838142

Baker- Eveleth, L., & Stone, R. W. (2015). Usability, expectation, confirmation, and continuance intentions to use electronic textbooks. *Behaviour & Information Technology*, *34*(10), 992–1004. https://doi.org/10.1080/0144929x.2015.1039061

Bobeth, S., & Kastner, I. (2020). Buying an electric car: A rational choice or a norm-directed behaviour? *Transportation Research. Part F, Traffic Psychology and Behaviour*, *73*, 236–258. https://doi.org/10.1016/j.trf.2020.06.009

Chen, T. D., Kockelman, K. M., & Hanna, J. P. (2016). Operations of a shared, autonomous, electric vehicle fleet: Implications of vehicle & charging infrastructure decisions. *Transportation Research Part A: Policy and Practice*, *94*, 243-254. https://trid.trb.org/view/1392661

David, B., & Giordano-Spring, S. (2021). Climate Reporting related to the TCFD Framework: An Exploration of the air Transport sector. *Social & Environmental Accounting/Social and Environmental Accountability Journal*, *42*(1–2), 18–37. https://doi.org/10.1080/0969160x.2021.2007784

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *Management Information Systems Quarterly*, *13*(3), 319-340 https://doi.org/10.2307/249008

Dimitropoulos, A., & Van Ommeren, P. R. J. (2013). Identifying potential early adopters of electric vehicles in Europe: The Company Car Market Case. *Energy Economics of Phasing Out Carbon and Uranium,13th IAEE European Conference, August 18-21, 2013*. http://www.iaee.org/proceedings/article/7389

Fazel, L. (2014). *Akzeptanz von Elektromobilität: Entwicklung und Validierung eines Modells unter Berücksichtigung der Nutzungsform des Carsharing*. Springer-Verlag.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/ebr-11-2018-0203

Holden, R. J., & Karsh, B. (2010). The Technology Acceptance Model: Its past and its future in health care. *Journal of Biomedical Informatics*, *43*(1), 159–172. https://doi.org/10.1016/j.jbi.2009.07.002

Huang, X., Lin, Y., Lim, M. K., Tseng, M., & Zhou, F. (2021). The influence of knowledge management on adoption intention of electric vehicles: a perspective on technological knowledge. *Industrial*

Management + Data Systems/Industrial Management & Data Systems, *121*(7), 1481–1495. https://doi.org/10.1108/imds-07-2020-0411

Hussain, Z. (2022). Z. (2022). Environmental and economic-oriented transport efficiency: The role of climate change mitigation technology. *Environmental Science and Pollution Research International*, *29*(19), 29165–29182. https://doi.org/10.1007/s11356-021-18392-4

Jia, J., Xu, J., Fan, Y., & Ji, Q. (2018). Willingness to accept energy-saving measures and adoption barriers in the residential sector: An empirical analysis in Beijing, China. *Renewable & Sustainable Energy Reviews*, *95*, 56–73. https://doi.org/10.1016/j.rser.2018.07.015

Kastner, I., & Stern, P. C. (2015). Examining the decision-making processes behind household energy investments: A review. *Energy Research & Social Science*, *10*, 72–89. https://doi.org/10.1016/j.erss.2015.07.008

Kim, M., Park, M., & Jeong, D. (2004). The effects of customer satisfaction and switching barrier on customer loyalty in Korean mobile telecommunication services. *Telecommunications Policy*, *28*(2), 145–159. https://doi.org/10.1016/j.telpol.2003.12.003

Krishnan, V. V., & Koshy, B. I. (2021). Evaluating the factors influencing purchase intention of electric vehicles in households owning conventional vehicles. *Case Studies on Transport Policy*, *9*(3), 1122–1129. https://doi.org/10.1016/j.cstp.2021.05.013

Liao, F., Molin, E., & Van Wee, B. (2016). Consumer preferences for electric vehicles: a literature review. *Transport Reviews*, *37*(3), 252–275. https://doi.org/10.1080/01441647.2016.1230794

Malatji, W. R., Van Eck, R., & Zuva, T. (2020). Understanding the usage, Modifications, Limitations and Criticisms of the Technology Acceptance Model (TAM). *Advances in Science, Technology and Engineering Systems Journal*, *5*(6), 113–117. https://doi.org/10.25046/aj050612

Mousazadeh, H., Jafarbiglu, H., Abdolmaleki, H., Omrani, E., Monhaseri, F., Abdollahzadeh, M., Mohammadi-Aghdam, A., Kiapei, A., Salmani-Zakaria, Y., & Makhsoos, A. (2018). Developing a navigation, guidance and obstacle avoidance algorithm for an Unmanned Surface Vehicle (USV) by algorithms fusion. *Ocean Engineering*, *159*, 56–65. https://doi.org/10.1016/j.oceaneng.2018.04.018

Perera, F., & Nadeau, K. (2022). Climate change, fossil-fuel pollution, and children's health. *New England Journal of Medicine*, 386(24), 2303-2314. https://doi.org/10.1056/nejmra2117706

Rezvani, Z., Jansson, J., & Bodin, J. (2015). Advances in consumer electric vehicle adoption research: A review and research agenda. *Transportation Research. Part D, Transport and Environment*, *34*, 122–136. https://doi.org/10.1016/j.trd.2014.10.010

Schwedes, O., Kettner, S., & Tiedtke, B. (2013). E-mobility in Germany: White hope for a sustainable development or Fig leaf for particular interests? *Environmental Science & Policy*, *30*, 72–80. https://doi.org/10.1016/j.envsci.2012.10.012

Segars, A. H., & Grover, V. (1993). Re-Examining perceived ease of use and usefulness: a confirmatory factor analysis. *Management Information Systems Quarterly*, *17*(4), 517. https://doi.org/10.2307/249590

Sierzchula, W., Bakker, S., Maat, K., & Van Wee, B. (2014). The influence of financial incentives and other socio-economic factors on electric vehicle adoption. *Energy Policy*, *68*, 183–194. https://doi.org/10.1016/j.enpol.2014.01.043

Stern, D. I. (2011). The role of energy in economic growth. *Annals of the New York Academy of Sciences*, *1219*(1), 26–51. https://doi.org/10.1111/j.1749-6632.2010.05921.x

Stone, R. W., & Baker-Eveleth, L. (2013). Students' expectation, confirmation, and continuance intention to use electronic textbooks. *Computers in Human Behavior*, *29*(3), 984–990. https://doi.org/10.1016/j.chb.2012.12.007

Wang, S., Wang, J., Li, J., Wang, J., & Liang, L. (2018). Policy implications for promoting the adoption of electric vehicles: Do consumer's knowledge, perceived risk and financial incentive policy matter? *Transportation Research. Part a, Policy and Practice*, *117*, 58–69. https://doi.org/10.1016/j.tra.2018.08.014

Wolske, K. S., & Stern, P. C. (2018). Contributions of psychology to limiting climate change: Opportunities through consumer behavior. In *Psychology and climate change* (pp. 127-160). Academic Press.

Wu, J., Liao, H., Wang, J., & Chen, T. (2019). The role of environmental concern in the public acceptance of autonomous electric vehicles: A survey from China. *Transportation Research. Part F, Traffic Psychology and Behaviour*, *60*, 37–46. https://doi.org/10.1016/j.trf.2018.09.029