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Drivers of Consumer Intention to Use Electric Vehicle: An Extended Technology Acceptance Model in the Context of Sustainable Transport

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ABSTRACT

Purpose - The purpose of the study is to find out the factors influencing the consumer intention to use Electric Vehicle in the context of sustainable transport. By using extended Technology Acceptance Model, the researchers tries to examine how the factors such as perceived ease of use, perceived usefulness, perceived risk and perceived environmental benefit influences the consumer intention to use Electric Vehicle.

Design/Methodology/Approach – This study employed a quantitative research design. Data was acquired from potential consumers in Chennai. Data was collected using the purposive random sampling method. A structured questionnaire was utilised to obtain information from respondents. Regression analysis was used to investigate the factors influencing consumers' intentions to use electric vehicles.

Findings – The study reveals that perceived usefulness, perceived ease of use and perceived environmental benefit intends the consumers to use Electric Vehicle but perceived risk does not create intention to use Electric Vehicle among the consumers.

Research Implications – The findings of the research contribute to the academic discourse on sustainable transport by extending the Technology Acceptance Model by adding new variables such as Perceived risk and perceived environmental benefit. This research helps to understand the consumer behavior towards sustainable transport (EV).

Practical Implications – This research is valuable to automakers, dealers, and marketers. Policymakers can concentrate on critical areas such as financial incentives, technological concerns, and upgrading charging infrastructures, which may be regarded barriers to EV adoption.

Social Implications – Adoption of EV reduces carbon footprints and air pollution. Consumer acceptance of EVs can help to develop an eco-friendly environment. Understanding the drivers of EVs will encourage customers to adopt them, hence improving societal well-being.

Originality/value – By encouraging sustainable transportation and customer desire to adopt electric vehicles, this study presents a new expansion of the technology acceptance model. Academicians and industry professionals can both benefit from the research's insightful findings.

Keywords: E-Vehicle, Sustainability, Transportation Sector, Extended Technology Acceptance Model, Consumer's Intention to use

INTRODUCTION

Shifting from petrol or diesel vehicle to Electric Vehicle is a challenging task. Consumer Acceptance and adoption of new technology does not happen instantaneously. It is a complex process which involves economic, technological, psychological and social factors. In order to create a sustainable environment, the transportation sector must come up with new technologies and policies and one among them was adopting to Electric Vehicles. And, the Government has to take various steps to promote E-Vehicles across the country. The widespread promotion and acceptance of E-Vehicles will help to achieve certain sustainable development goals. The sustainable transportation sector, particularly in the context of E-vehicles, is an important part of worldwide efforts to reduce environmental impacts, reduce reliance on fossil fuels, and establish more sustainable urban and rural transportation networks. The entire world is working to attain the goals of sustainable development. Usage of E-vehicle comes under sustainable development goals; it addresses the seventh goal of "affordable and clean energy". SDG 8 "focuses on economic growth". SDG 9 focuses on "industrial innovation". SDG 11 "Zero pollution", SDG 12 focuses on "responsible production and consumption". SDG 13 aims "to reduce greenhouse gas emissions", whereas SDG 15 focuses on "land and water ecosystem conservation", (UN Sustainable Development Goals).

Despite the fact that India is the world's third largest automobile manufacturer. It must also focus on their long-term sustainability. This research concentrates on consumer's acceptance and their intention to use E-vehicle. Consumer intention to use refers to the consumer willingness and readiness to accept, consider and use the product. There are various factors involved in acceptance of Electric Vehicle such as Awareness about availability of Electric Vehicle, Performance of the vehicle, financial factors, Availability of Charging station, spare parts and repairing workshops and their pro-environmental behavior, (Nagaraj Navalagund et.al 2020). And consumers also evaluate environmental zeal, social perception, perceived advantage, performance expectations, and technological enthusiasm while choosing an electric vehicle. The study proposed that an effective awareness and advertising campaign must be developed to disseminate information about electric vehicles, (Furquan A. Bhat et.al 2021). The main aim of the research is to examine the factors influencing the consumer intention to use E-Vehicle. Though there are various studies undertaken in this concept, this study differentiate them by using the theoretical framework of Extended Technology Acceptance Model.

REVIEW OF LITERATURE

Technology Acceptance Model (TAM)

TAM was introduced by Fred Davis, it was derived from the psychology theories such as Theory of Reasoned Action and Theory of Planned Behaviour. Though this theory was developed to accept the latest technology by the employees, but it has also extended to various field as well. In this research, this theory is used to find out the factors influencing the consumers to adopt EV. Many researchers has used this theory to find out the consumer intention to use EV, the factors such as innovation of the product, incentives, promotion techniques, product and price advantage influenced them to purchase EV (*Nagarajan Shanmugavel et.al 2022).* Based on TAM another study made use of factors such as Usefulness, experience of the consumer and consumer ease to use, *(Hendra Noor Saleh, et.al 2024).* This research used Extended Technology Acceptance Model

as the base for the study. In this study, researcher added few variables in addition to the existing variables such as perceived risk and perceived environmental benefit.

Perceived ease of use

Perceived ease of use considered to be one of the most influential factor in adoption of Electric Vehicle and it refers to easy handling of electric vehicle by the consumer. It was measured in term of operating efficiency, charging infrastructure facility and its maintenance. If these factor satisfied the potential consumer, then they would intent to purchase EV in near future, *(Hendra Noor Saleh, et.al 2024).*

Perceived usefulness

Perceived usefulness refers to how a product is beneficial and useful to the consumer and it must also try to fulfill the need of the consumer. Thus, perceived usefulness considered to be one of the most influential factor in EV adoption, *(Hendra Noor Saleh, et.al 2024).* Another researcher made use of perceived usefulness as a mediator between independent variables such as product innovativeness, personal influence, promotion technique, price and product advantages and the dependent variable intention to adopt EV, (*Nagarajan Shanmugavel et.al 2022).*

Perceived Risk

Perceived risk refers to the risk associated to the performance of electric vehicle and also in terms of financial risk associated with it, (Zeinab Rezvani et.al 2015). It includes factors such as safety of the vehicle, availability of charging station in the nearby areas and risk associated with technology, (Wenbo Li 2017). The durability of the vehicle and its performance for a longer period where one of the most important factor which affects the consumer intention to purchase, (Xiang Zhang 2018). Adopting to the new technology (EV) creates anxiety among the consumers, *(Nicolette D.Caperello)*

Perceived Environmental Benefit

Environmental Benefit refers to lowering the air pollution and carbon footprints, even less noise pollution creates intention to adopt EV, (Fanchao Liao 2017). Concern about the environment also creates intention among the consumer to adopt EV, (*Haider Ali Abbasi et.al 2021).* To reduce the dependency on the fossil fuels, the consumers showed interest towards acceptance of EV, *(Andre Hack Barth 2016).*

Intention to use EV

A research was carried out among young people to determine their adoption of electric vehicles. Variables influencing them included perceived utility, perceived risk, electric vehicle knowledge, and perceived simplicity of usage. The study revealed that utility of the vehicle encouraged consumers to adopt electric automobiles, but the risk component discouraged them. *(Deepak Jaiswal et.al, 2022).* To discover the factors influencing consumer desire to purchase electric automobiles. The researcher employed both the theory of risk model and the technology acceptance model to assist the investigation. The researcher developed the model using SEM analysis. The independent variables such as ease of use, risk, and usefulness had a significant impact on the attitude component, which raised consumers' motivation to make purchases. The study discovered that operating electric vehicles was easier and that their usability contributed to a more favourable attitude towards their acceptance, *(Song Yankun 2020).*

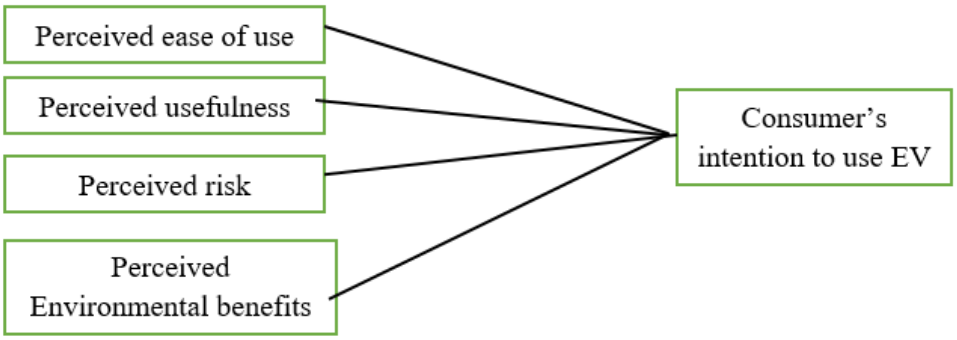
RESEARCH METHODOLOGY AND HYPOTHESES

This is a descriptive and quantitative research and purposive random sampling method was used to collect data from the consumers. Both primary and secondary data was used for this study. Primary data was collected through structured questionnaire in Chennai city from 100 respondents. 5-point Likert scale questionnaire was used and it was adopted from the previous research studies. Perceived Ease of Use and Perceived Usefulness (Lee et al., 2021), Perceived Environmental Benefits (Davis, 1989) & (Lee et al., 2021), Perceived Risk Steinhilber et al. (2013), Zhang et al. (2013) and acceptance of EV (M.K.Kim et.al, 2018). The independent variables used for this study were Perceived Ease of Use, Perceived Usefulness, Perceived Environmental Benefit, Perceived Risk and the dependent variable is consumer's intention to use EV.

Hypothesis Development

H1 – Perceived ease of use has a positive impact on the consumer's intention to use E-vehicle.
H2 – Perceived usefulness has a positive impact on the consumer's intention to use E-vehicle.
H3 – Perceived risk has a positive impact on the consumer's intention to use E-vehicle.
H4 - Perceived environmental benefits has a positive impact on the consumer's intention to use E-vehicle.

Conceptual Framework



(Source: own)

DATA ANALYSIS AND INTERPRETATION

Multiple Regression Analysis was used to analyse the factors influencing the consumer's intention to use EV. The independent variables used in this study were Perceived Ease of Use, Perceived Usefulness, Perceived Environmental Benefit, Perceived Risk and the dependent variables was Consumer intention to use EV.

Table 1: Regression Model: Factors influencing the consumer's intention to use EV

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.664[a]	.442	.412	3.81735	1.906
a. Predictors: (Constant), PEU, PU, PR, PEB					
b. Dependent Variable: INT					

(Source: Computed Data)

The above table shows the model overview of factors influencing consumer's intention to use EV. The modified R square value displays the percentage of the variations explained by factors of EV on consumer's acceptance. The modified R square value is 0.412, which shows that 41% of the factors influence consumer's intention to use.

Table 2: ANOVA – Impact of factors on consumer intention to use EV

Model	Sum of Squares	Df	Mean Square	F	Sig.

1	Regression	1082.967	5	216.593	14.864	.000[b]
	Residual	1369.783	94	14.572		
	Total	2452.750	99			
a. Dependent Variable: INT						
b. Predictors: (Constant), PEB, PR, PU, PEU						

(Source: Computed Data)

Table 2 shows the result of ANOVA. Since F value is 14.864, p value is 0.000 < 0.01, it shows that the model is significant at 1% level.

Table 3. Regression coefficient of variables in the Multiple Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.235	2.236		.105	.916
	PEU	.703	.161	.489	4.371	.000**
	PU	.374	.085	.362	4.408	.000**
	PR	-.034	.179	-.019	-.191	.849
	PEB	.540	.134	.380	4.033	.000**
a. Dependent Variable: INT						

+ Note: ** Denotes significant at 1% level
(Source: Computed Data)

Table 4. Hypothesis Framework

Hypothesis	Regression Path	Effect Type	Remarks
H1	PEU -> INT	Direct effect	Supported
H2	PU -> INT	Direct effect	Supported
H3	PR -> INT	Direct effect	Not supported
H4	PEB -> INT	Direct effect	Supported

The multiple regression equation is

Y = 0.235 +0.703 X1+ 0.374 X2 - 0.034 X3 + 0.540 X4.

H1: Perceived ease of use has a positive impact on the consumer's intention to use EV.
The hypothesis was tested by using regression analysis. The coefficient of X1 is 0.703. The result revealed that the perceived ease of use has significant positive influence on consumer intention to use EV. Since p value is less than 0.01, we accept the hypothesis 1.

H2: Perceived usefulness has a positive impact on the consumer's intention to use EV.
The coefficient of X2 is 0.374, it indicates the positive effect. Perceived Usefulness create positive impact on the consumers. Since p value is greater than 0.01, we accept the hypothesis. Therefore, perceived usefulness has a positive impact on the consumer's intention to use EV.

H3: Perceived Risk has a positive impact on the consumer's intention to use EV.

The coefficient of X3 is -0.034, it indicates the negative effect of Perceived Risk. Since p value is greater than 0.01, we reject the hypothesis 3. Therefore Perceived risk does not have a positive impact on the consumer's intention to use EV.

H4 - Perceived Environmental benefit has a positive impact on the consumer's intention to use EV.

The coefficient of X4 is 0.540, it indicates the positive effect of Perceived Environmental benefit. Since p value is less than 0.01, we accept the hypothesis 4. Therefore Perceived Environmental benefit have a positive impact on the consumer's intention to use EV.

FINDINGS

The study discovered that factors such as perceived ease of use, perceived usefulness and perceived environmental benefit have a positive influence on consumer intention to use EV. This is because consumers are becoming more concerned about the environment. According to *Takanori Okada et al. (2019)*, as consumers' ages increase, so does their care for the environment. As a result, consumers places an emphasis on environmental friendliness. Consumers think that driving an electric vehicle is a societal responsibility for every citizen. The use of electric vehicles reduces carbon footprints and air pollution. E-vehicle lacks sophisticated procedures and is relatively simple to operate. It also saves consumers' time and money. EV development is required for a sustainable future. This study supports the previous study conducted by *Deepak Jaiswal et.al. (2021).*

However, other variable such as perceived risk have no impact on people's willingness to use EV. The reason for non-acceptance was the risk concerns involved in it and safety and reliability of EVs play a big role, because a few EVs explode abruptly while in use, therefore people were afraid to use them. Other drawbacks include the cost of maintenance and repairs, a lack of charging infrastructure, and the inability to use for a longer distance. According to *Sriram et.al (2022),* Price, charging infrastructure, and performance are all variables influencing customer acceptance of electric vehicles.

SUGGESTIONS

- Proper awareness must be created among the consumer's regarding E-vehicle.
- The government must take steps to promote E-vehicles to the general public.
- Adequate charging infrastructure facilities must be provided.
- Price of EV must be reduced.

LIMITATION AND FURTHER RESEARCH

This study is concise only to Chennai city and minimum sample size has been taken. Further research can be done in different regions and it can concentrate on financial factors that influence on consumer's acceptance.

CONCLUSION

Every coin has two sides, in the same way, Electric Vehicle has both merits and limitations. The manufacturers of E-vehicles must overcome all those limitations and must create positive attitude in the minds of the general public. Thus, the main aim of the study is to find out the consumer intention to use E-Vehicles by using Extended Technology acceptance Model. The survey provided valuable insights into the factors influencing customer acceptance of E-Vehicles. As a result, everyone desired a pollution-free atmosphere, so green vehicles must be implemented to preserve the environment green. Therefore, transportation sector can attain sustainability in this manner.

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