

CONSUMER AWARENESS TOWARDS ELECTRIC VEHICLES IN THIRUVANANTHAPURAM DISTRICT

***Dr. Indurajani R**

Abstract

The transition to electric vehicles (EVs) is an important component of global attempt to lessen carbon emissions and to promote sustainable transportation. The adaptation of EVs largely depends on the public awareness and acceptance of EV technology. This research paper aims to evaluate the need, awareness, understanding and attitude of people towards EVs by administering interview schedule. The study also assesses the challenges of EVs. The findings of the study depict lack of awareness about EVs in respect of factors like incentives and subsidies, vehicles models and types, charging infrastructure etc. Based on findings the study proposes awareness campaigns and policy recommendations to boost public knowledge.

Keywords:- Consumer awareness, Electric Vehicles, Carbon Emissions, Sustainable Transportation, Incentives and Subsidies, Charging Infrastructure, eco- friendly.

In the modern era, the global concern is shifting towards environmentally friendly solutions in all industries, including the automotive industry. The automotive sector is also shifting towards eco-friendly options such as electric vehicles. The electric vehicle segment of the market is witnessing significant growth as it offers

pollution-free driving. The main benefit of electric vehicles is the contribution they can make to improving air quality in cities and towns. Without a tailpipe, eco-friendly electric vehicles do not produce carbon dioxide or other harmful environmental products while driving. This reduces air pollution considerably.

**Dr. Indurajani R, Associate Professor, PG & Research Department of Commerce, Government College Nedumangad, University of Kerala, Thiruvananthapuram.*

Review of Literature

Rumi Aijaz (2022) analyzed the India's EV initiatives in his research paper "Electric Vehicles in India: Filling the Gaps in Awareness and Policy". He concluded that the Government of India is offering financial and technical support for the holistic development of the electric vehicle sector.

Zulfiqar Ali Lashari (2021) and others attempted to investigate aspects influencing consumer intention to adopt EV, including inventive, technological, environmental, and economic benefits. According to the findings, consumers' own attitudes and opinions have an impact on their decision to purchase electric automobiles.

Saiful Hasan (2021) attempted to predict consumer intent to repurchase electric vehicles. Consumer satisfaction with EV benefits, such as cost, range, recharge, policy measure, environmental qualities, symbolic attributes, and model availability motivate consumers to repurchase EVs, according to the study.

Parmar and Pradhan (2021) tried to identify consumer knowledge and decision criteria for purchasing an electric vehicle. According to their research, consumers are motivated by a variety of considerations, including environmental awareness, minimal noise, pricing, and new trends also consumers are less aware of government subsidies, they must be advertised more.

Rajper S. Z, (2020) and colleagues analyzed the electric vehicle potential in poor nations. The study looked into electric two-wheelers (E2Ws), hybrid

vehicles, and electric four-wheelers (E4Ws). E2Ws are more affordable for developing countries due to their low purchase price and low operating costs.

Statement of the Problem

Electric vehicles are the future of Indian transportation. The government is taking initiative to introduce policies to slowly impart the electric vehicles in the Indian customer segment. The government aims at fully electrifying the India's transport system by near future.

In the light of above context, this research paper "CONSUMER AWARENESS TOWARDS ELECTRIC VEHICLES IN THIRUVANANTHAPURAM DISTRICT" aims at studying the need of electric vehicles among consumers and to analyze how much the people are aware of the advantages of electric vehicle and to assess the challenges in other alternative fuel vehicles among the consumers. In short, the problems of adapting to new standards, the cost involved in it and transition to new technology will take time based on the consumers' understanding towards the electric vehicles which is the focus of the study.

Significance of the Study

The electric vehicle is on the verge of experiencing rapid growth in both developed and developing vehicle markets. The broad-scale adoption of the electric vehicle could bring significant changes for society in terms of not only the technologies we use for personal transportation, but also helps our economies to reduce the carbon footprint because there will be zero tailpipe

emission. By switching to EVs, India will curb its CO₂ emissions. This feat will translate into less air pollution in metros and mini metros and will keep the present and future generations healthier. This study investigates the awareness of people about electric vehicles; to identify the factors that influence costumer purchase decision, thus help the Government and companies to know the acceptance level of electric vehicles.

Objectives of the Study

1. To understand the need for electric vehicles among the consumers.
2. To assess the challenges in other alternative fuel vehicles among the consumers.
3. To analyse the understanding of the electric vehicles among the consumers.

Scope of the Study

The consumers of Trivandrum District are the respondents for the study. The data for the study were collected for a period of six months starting from June 2024. EV consumers include two wheelers, three wheelers and four wheelers.

Methodology

The study is based on both primary and secondary data. Primary data were collected by administering interview schedule and the secondary data were collected from various books, journals, reports, internet etc. Respondents were selected randomly and the sample size is 100. For data analysis and interpretation, tools such average, percentage, one sample t – test were used.

Hypotheses

- H0:** Consumers do not have adequate understanding about electric vehicles.
- H1:** Consumers have adequate understanding about electric vehicles.

Benefits of Electric Vehicles

Transport is a basic requirement of modern life. Traditional vehicles using petrol or diesel are highly polluting and these vehicles being replaced by fully electric vehicles. Electric vehicle have zero tailpipe emissions and much good for the environment. Running cost of electric vehicle is lower than petrol or diesel vehicle. These vehicles use electricity charged batteries instead of fossil fuels like petrol or diesel. Electric vehicles don't have many moving parts when compared to traditional vehicles. Further service cost also lesser. By using renewable energy source for charging, it can reduce the environmental impact. There are many policies and incentives offered by the government depending on the various states. These include lesser registration fees and road tax on purchasing vehicles etc.

Incentives Offered by Government of India

Government offers different types of electricity vehicle incentives to make electric vehicles more affordable. Purchase incentives in the form of direct discount provided to the user on the cost of the electric vehicle. Other incentives include interest subventions as discount offered on the interest rate while availing loan, registration fee exemption, road tax exemption, income tax benefits, special incentives, interest free loans, top up subsidies, etc.

Results and Discussion

Electric vehicles are very eco friendly and beneficial and can improve the quality of human life. They do not utilize any fossil fuels such as petrol, diesel or even gasoline (CNG). It utilizes rechargeable battery pack to power the electric motor rather than a combustion engine. They make no noise and they are supported by government incentives.

Profile of the Respondents

The profiles of the respondents were analyzed by using the variables such as gender, age, location, educational qualification etc. All the variables analyzed in connection with consumers had some bearing on the awareness level on electric vehicles.

Out of 100 respondents, 65 respondents (65 per cent) are males and 35 respondents (35 per cent) are females. Majority of the respondents are from rural area and more than half of the respondents are graduates.

The table 1 reveals that 100 percentages of the respondents heard about electric vehicles.

The analysis found that 55 per cent of the respondents strongly agree and 7 per cent of respondents have neutral opinion with regard to environmental concern (Table 2) . In case of cost savings, 62 per cent agreed that cost saving is the factor that determines the need for electric vehicles and 8 per cent come under neutral category. 54 per cent of the respondents

Table 1
Auditory range of Electric vehicle

Opinion	No. of Respondents	Percentage
Yes	100	100
No	0	0

Source: Primary Data

Table 2
Factors determining the need for electric vehicle

Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Weighted mean
	%	%	%	%	%	
Enviromental Concern	55	38	7	0	0	29.87
Cost savings	15	62	8	15	0	25
Government incentives	23	54	23	0	0	26.67
Technology advancement	62	38	0	0	0	30.8
Energy Efficiency	31	48	15	6	0	26.93
Brand image and social status	15	15	55	15	0	22

Source: Primary Data

agree that government incentives determine the need for electric vehicle and 23 per cent have neutral opinion. Further with regard to Technology advancement 62 per cent come under strongly agree and 38 per cent fall under agree category. With respect to energy efficiency, 48 per cent agreed to this factor and 6 per cent come under the opinion disagree. 55 per cent of the respondents have neutral opinion with regard to brand image and social status 15 per cent come under the opinion agree and neutral. Overall the analysis showed that the factor technology advancement ($x = 30.8$) determine the need for electric vehicle.

It is found that 38 per cent of the respondents strongly agree and 38 per cent of respondents have agree with regard to lower operating costs, 24 per cent fall under the category of neutral (Table 3). In case of reduced greenhouse gas emissions, 76 per cent strongly agreed that electrical vehicle reduces greenhouse gas emissions and 8 per cent come under agree, neutral, and disagree category. 69

per cent of the respondents strongly agree that quieter operation is advantage of electric vehicle and 31 per cent have agreed this opinion. Further with regard to Tax incentives and rebates 54 per cent comes under the category of agree and 15 per cent fall under neutral category. With respect to access to carpool lanes and restricted areas, 54 per cent fall under neutral and 7 per cent comes under the opinion agree. 54 per cent of the respondents strongly agreed with regard to lower maintenance costs 15 per cent come under the opinion agree. Overall the analysis showed that the quieter operation ($\bar{x} = 31.27$) is the advantage of electric vehicle.

Table 4 showed that 54 per cent of the respondents strongly agreed and 8 per cent of respondents have neutral opinion with regard to Environmental impact. In case of dependency on fossil fuels 49 per cent strongly agreed and 25 per cent fall under neutral category. 46 per cent of the respondents strongly agree that higher operational cost is a major challenge and

Table 3
Advantage of Electric vehicle

Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Weighted mean
	%	%	%	%	%	
Lower operating costs (e.g., electricity vs. fuel)	38	38	0	24	0	26
Reduced greenhouse gas emissions	76	8	8	8	0	30.13
Quieter operation	69	31	0	0	0	31.27
Tax incentives and rebates	31	54	15	0	0	27.73
Access to carpool lanes and restricted areas	23	7	54	8	8	21.93
Lower maintenance costs	54	15	31	0	0	28.2

Source: Primary Data

Table 4
Challenges of fuel vehicles

Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Weighted mean
	%	%	%	%	%	
Environmental impact	54	38	8	0	0	29.73
Dependency on fossil fuels	49	26	25	0	0	28.27
Higher operational cost	46	31	23	0	0	28.2
Public health and concerns	47	23	15	0	15	25.8
Noise pollution	46	38	16	0	0	28.67
Limited fuel efficiency	77	15	8	0	0	31.27
Maintenance and operating cost	46	32	8	7	7	26.87
Reduced incentives and regulations	40	7	46	7	0	25.33

Source: Primary Data

23 per cent have neutral opinion. Further with regard to Public health and concerns 47 per cent strongly agree and 15 per cent fall under neutral and strongly disagreed category. With respect to noise pollution, 46 per cent fall under strongly agree and 16 per cent comes under the opinion neutral. 77 per cent of the respondents strongly agreed with regard to limited fuel efficiency and 8 per cent fall under the opinion neutral. 46 per cent of respondents are strongly agreed that maintenance and operating cost of fuel vehicles is very high and 7 per cent come under disagree and strongly disagree respectively. 40 per cent of respondents strongly agreed that the reduced incentives and regulations is a major challenge and 7 per cent respondents fall under agreed and disagreed respectively. Overall analysis showed that the limited fuel efficiency (\bar{x} = 31.27) was the challenge of fuel vehicles.

Table No. 5 depicted consumers understanding about electric vehicle. 46 per cent have understanding about range and Battery life and 8 per cent disagree to it. 38 per cent agreed and 7 per cent disagreed with regard to charging infrastructure. 40 per cent have knowledge about charging speed and 7 per cent have no knowledge about charging speed. 38 per cent come under agree and 31 per cent of respondents come under strongly agree and neutral respectively in case of cost. But in case of incentives and subsidies, 38 per cent have agree and neutral opinion, 7 per cent disagree to this variable. Further 38 per cent come under both category ie agree and strongly agree, 24 per cent under neutral in case of performance. 58 per cent of the respondents have knowledge about environmental impact and 23 per cent responded as neutral. 31 per cent have neutral opinion and 7 per cent are familiar with vehicle types and models. With

Table 5
Consumers understanding about Electric Vehicles

Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Weighted mean
	%	%	%	%	%	
Range and Battery life	46	15	31	8	0	26.6
A charging infrastructure	32	38	23	7	0	26.33
Charging speed	40	15	31	7	7	24.93
Cost	31	38	31	0	0	26.73
Incentives and subsidies	17	38	38	7	0	24.33
Performance	38	38	24	0	0	27.6
Environmental impact	54	23	23	0	0	28.73
Vehicle types and models	24	7	31	31	7	20.67
Resale value	23	31	46	0	0	25.13

Source: Primary Data

regard to resale value 46 per cent respondents fall under neutral category and only 23 per cent have understanding about resale value. Overall the respondents have more knowledge about environmental impact (\bar{x} = 28.73) than other variables under study.

The table 6 showed 46 per cent of respondents were agreed that limited

driving range is the challenge of electric vehicle and 23 per cent have neutral opinion on it. 54 per cent have understanding about lack of charging infrastructure and 15 per cent have neutral opinion with regard to lack of charging infrastructure. 40 per cent come under strongly agree, 7 per cent disagree and strongly disagree category. Further, 38 per

Table 6
Challenges of electric vehicle

Factors	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Weighted mean
	%	%	%	%	%	
Limited driving range	31	46	23	0	0	27.2
Lack of charging infrastructure	31	54	15	0	0	27.73
Longer refueling time	38	31	31	0	0	27.13
Higher upfront purchase cost	38	47	15	0	0	28.2
Limited options and models	38	17	23	15	7	24.27
Concerns about battery life	38	32	23	7	0	26.73

Source: Primary Data

cent have knowledge about longer refuelling time and 31 per cent have neutral opinion about longer refuelling time. 47 per cent come under agree and 15 per cent of respondents come under neutral respectively in case of higher upfront purchase cost. But in case of limited options and models 38 per cent strongly agreed and 7 per cent have neutral opinion, 38 per cent strongly agreed the concerns about battery life and 7 per cent have neutral opinion. Overall the respondents have an opinion that the higher upfront purchase cost is the challenge of electric vehicles (\bar{x} = 28.2) than other variables under study.

Hypothesis Testing

- H0:** Consumers do not have adequate understanding about electric vehicles.
- H1:** Consumers have adequate understanding about electric vehicles

One sample t- test has been applied for hypothesis testing. There is a significant

difference between average score and sample mean score in respect to all variables under study in connection with consumers understanding about electric vehicles (p- value <0.05). Hence the null hypothesis expressing consumers do not have adequate understanding about electric vehicles failed to accept i.e. consumers have adequate understanding about electric vehicles.

Findings

Majority of the respondents are males and from rural area. All the respondents heard about electric vehicles. The main source of information relied by the consumers to understand about electric vehicles are from the manufactures website. Technology advancement determines the need for electric vehicle. According to the analysis quieter operation is the advantage of electric vehicle. Limited fuel efficiency is the main challenge of fuel vehicles and higher upfront purchase cost is the main

Table 7
Consumers understanding about Electric Vehicles – One sample t-Test

Variables	Mean (\bar{x})	SD	t-value	p-value
Range and Battery life	3.99	1.0488	4.695	<0.0001
A charging infrastructure	3.95	0.9097	4.946	<0.0001
Charging speed	3.74	1.2459	1.927	0.028
Cost	4.00	0.7874	6.35	<0.0001
Incentives and subsidies	3.65	0.8412	1.783	0.038
Performance	4.14	0.7751	8.26	<0.00001
Environmental impact	4.31	0.8219	9.85	<0.0001
Vehicle types and models	3.10	1.2753	-3.137	0.002
Resale value	3.77	0.8022	3.36	0.0005
Overall understanding	3.85	0.349	3.01	0.0078

Source: Primary Data

challenges of electric vehicles. Respondents have more knowledge about environmental impact than other variables under study. Their future expectation on electric vehicle is based on Battery and Technology advancement and Affordability.

Recommendations

Since there exist a strong relationship between awareness levels of customers on Electric Vehicles and purchase patterns, the government should try to create more awareness by conducting EV campaign addressing about EV range, performance, safety etc. and make some rules like one electric vehicle per house. EV experience programs such as free test drive events, EV expos and interactive workshop should be organized to familiarize with EVs. Government has to give more subsidies for purchasing Electronic Vehicles so that more people opt for it and hence we can reduce pollution to a great extent and contribute for the betterment of society and our future generation. Reduced tax rates can attract buyers to buy electric vehicles to a certain extent. By lowering the initial cost of electric vehicles, there will be a growing

market in the near future. More charging stations have to be build up across different regions and places like malls, office complexes, and highways etc, offer easy install home charging kit while purchasing EVs. Provide lower electricity rates while charging EVs night or off peak hours.

Conclusion

From the study it is found that even though customers have a feeling that the initial costs are high, they prefer electric vehicles as the associated costs are low. The introduction of electric vehicles has helped customers to reduce their travelling expense. Many people consider relief from high petrol price and low maintenance costs are the important factors helped to reduce travelling expense. Initial cost of purchase, a smaller number of charging station and the time required to recharge the battery is creating limitation in boosting consumer confidence. Despite the problems and limitations posed by electric vehicles, customers are still willing to buy electric vehicles as it helps to reduce overall travelling expense.

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