



A STUDY ON BARRIERS TO ADOPTION OF E-VEHICLE

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Abstract

There is a depletion of fossil fuels and its price hike, there is need for another energy resource to run the vehicle. E Vehicle offers a eco-friendly alternative to internal combustion vehicles. However, there are some barriers to adopt E Vehicle like limited charging infrastructure, purchase cost, limited model availability. This study aims to find out the barriers to adopt E Vehicle. EVs offer a promising solution to reducing greenhouse gas emissions and combating air pollution, making them essential for mitigating climate change and improving public health. By investigating the environmental benefits of EVs and their impact on carbon emissions, researchers can provide valuable insights for policymakers, industries, and the public.

Keywords: E Vehicle, Charging Station, barriers.

1.INTRODUCTION

The growing interest in electric vehicles (EVs) reflects a significant shift in consumer attitudes toward sustainable transportation. As the world grapples with climate change, EVs have emerged as a crucial solution in reducing our carbon footprint and transitioning towards a greener future. Their increasing popularity has also spurred numerous automotive companies to invest heavily in research and development, expanding the market with a variety of models to suit different consumers' needs.

EVs primarily rely on electricity for their functioning, significantly reducing the emission of greenhouse gases and other pollutants. These are becoming increasingly popular as more people are opting for sustainable transportation options. E Vehicle offers a eco-friendly alternative to internal combustion vehicles. However, the infrastructure to support these

vehicles is still catching up, and one of the biggest challenges in this regard is building and charging stations and its maintenance. The problems in adoption of electric vehicle is analyzed. As technology continues to evolve, EVs are becoming more accessible and affordable than ever before.

Electric vehicles don't have gears and are very convenient to drive. There are no complicated controls, just accelerate, brake, and steer. Charging electric vehicle, just plug it in to a home or public charger. Electric vehicles are also quiet, so they reduce noise pollution that traditional vehicles contribute to. Electric vehicles have the silent functioning capability as there is no engine under the hood. No engine means no noise. The electric motor functions so silently that you need to peek into instrument panel to check if it is ON. Electric vehicles are so silent that manufacturers have to add false sounds in order to make them safe for pedestrians. Driving an electric vehicle can help to reduce carbon footprint because there will be zero tailpipe emissions.

2. OBJECTIVES OF THE STUDY

- To analyse the accessibility of the charging station.
- To investigate the barriers to adoption of E Vehicle among users.
- To study the expectations of E Vehicle among users.
- To evaluate the government policies and incentives to adopt E Vehicles.

3. RESEARCH METHODOLOGY

The total number of respondents for this study is 110. The area covered under this research is Coimbatore city. The primary data was collected for this study. The method used for the collection of primary data is questionnaire method. Primary data is the data which is collected by the research directly from own observation and experience. The objective of the study has been accomplished with the help of primary data collected. Convenience sampling method is used for this study.

Tools Used for analysis

The following statistical tools have been used to analyse the primary data collected

- Percentage analysis method
- Descriptive statistics
- Garret ranking analysis
- ANOVA analysis
- Chi – square method

4.ANALYSIS AND INTERPRETATION

TABLE NO. 4.1

RESIDENTIAL AREA OF THE RESPONDENTS

Residential area	No of respondents	Percentage
Rural	25	22.7
Urban	60	54.5
Semi urban	25	22.7
Total	110	100.0

The above table shows that out of 110 respondents, 22.7% are from rural area, 54.5% are from urban area and 22.7% are from semi urban area.

TABLE NO. 4.2 GENDER OF THE RESPONDENTS

Gender	No of respondents	Percentage
Male	60	54.5
Female	50	45.5
Total	110	100.0

The above table shows that out of 110 respondents, 54.5% are male and 45.5% are female.

TABLE NO. 4.3
AGE OF THE RESPONDENTS

Age	No of respondents	Percentage
Below 18 years	7	6.4
19 - 25 years	44	40.0
26 - 35 years	31	28.2
36 - 45 years	21	19.1
Above 46 years	7	6.4
Total	110	100.0

The above table shows that out of 110 respondents, 6.4% belongs to below 18 years, 40% belongs to 19-25 years, 28.2% belongs to 26-35 years, 19.1% belongs to 36-45 years and 6.4% belongs to above 46 years.

Most 40% of the respondents belongs to 19-25 years.

TABLE NO. 4.4
EDUCATIONAL QUALIFICATION OF THE RESPONDENTS

Educational Qualification	No of respondents	Percentage
No formal education	1	0.9
School	15	13.6
Diploma	24	21.8
Undergraduate	53	48.2
Postgraduate	17	15.5
Total	110	100.0

The above table shows that out of 110 respondents, 0.9% are no formal education, 13.6% are school, 21.8% are diploma, 48.2% are undergraduate and 15.5% are postgraduate.

TABLE NO. 4.5 OCCUPATION OF THE RESPONDENTS

Occupation	No of respondents	Percentage
Student	27	24.5
Employee	41	37.3
Professional	7	6.4
Business	18	16.4
Home maker	17	15.5
Total	110	100.0

The above table shows that out of 110 respondents, 24.5% are students, 37.3% are employees, 6.4% are professionals, 16.4% are businessmen and 15.5% are home maker.

Mostly 37.3% of the respondents are employees.

TABLE NO. 4.6
FAMILY MONTHLY INCOME OF THE RESPONDENTS

Family monthly income	No of respondents	Percentage
Below 10,000	8	7.3
10,001 - 25,000	45	40.9
25,001 - 50,000	37	33.6
Above 50,001	20	18.2
Total	110	100.0

The above table shows that out of 110 respondents, 7.3% belongs to the income group of below 10,000, 40.9% belongs to the group between 10,001-25,000, 33.6% belongs to the group between 25,001-50,000 and 18.2% belongs to the group of above 50,001.

TABLE NO. 4.7
MARTIAL STATUS OF THE RESPONDENTS

Martial status	No of respondents	Percentage
Married	59	53.6
Unmarried	51	46.4
Total	110	100.0

The above table shows that out of 110 respondents, 53.6% are married and 46.4% are unmarried

TABLE NO: 4.8
E VEHICLE OF THE RESPONDENTS

Vehicle	No of users	Percentage
Two wheeler	84	76.4
Three wheeler	2	1.8
Four wheeler	42	38.2

The above table shows 84 two wheelers are used, 2 uses three wheeler are used and 24 fourwheelers are used.

TABLE NO. 4.9 DISTANCE TRAVELLED IN E-V

Distance Travelled	No of respondents	Percentage
Less than 50 miles	31	28.2
51 -100 miles	42	38.2
101-150 miles	26	23.6
More than 151 miles	11	10.0
Total	110	100.0

The above table shows that out of 110 respondents, 28.2% users travelled less than 50 miles, 38.2% users travelled 51-100 miles, 23.6% users travelled 101-150 miles and 10% userstravelled more than 151 miles.

TABLE NO. 4.10 CHARGING PREFERENCE OF E-V

Prefer to charge	Regularly	Occasionally	Rarely
Home	103	4	3
Workplace	20	37	53
Charging station	16	31	63
Hotel/Restaurant	10	29	71

(SOURCE: PRIMARY DATA)

INTERPRETATION:

The above table shows that out of 110 respondents, 103 charge regularly in home, 53 charge rarely in workplace, 63 charge rarely in charging station and 71 charge rarely in hotel/restaurant.

TABLE NO. 4.11 TYPE OF CHARGING

TYPE OF CHARGING	NO OF RESPONDENTS	PERCENTAGE
Level 1	12	10.9
Level 2	32	29.1
DC fast charging	65	59.1
Others	1	0.9
Total	110	100.0

The above table shows that out of 110 respondents, 10.9% prefer level 1 charging, 29.1% prefer level 2 charging, 59.1% prefer DC fast charging and 1% prefer others.

It is inferred that (59.1%) of the respondents prefer DC fast charging.

TABLE NO. 4.12 PREFERENCE TO PAY FOR CHARGING

PREFER TO PAY FOR CHARGING	NO OF FREQUENCY	PERCENTAGE
Subscription/Membership	43	39.1
RFID card/Key fob	37	33.6
Card reader	27	24.5
Others	3	2.7
Total	110	100.0

The above table shows that out of 110 respondents, 39.1% prefer to pay through subscription/ Membership, 33.6% prefer RFID card/ Key fob, 24.5% prefer DC Card reader and 2.7% prefer others.

It is inferred that 39.1% of the respondents prefer to pay through subscription/membership.

TABLE NO. 4.13

LEVEL OF ACCESS TO CHARGING STATION

Access to charging station	No of respondents	Percentage
Very convenient	26	23.6
Somewhat convenient	37	33.6
Not very convenient	36	32.7
Convenient not at all	11	10.0
Total	110	100.0

The above table shows that out of 110 respondents, 23.6% users are very convenient in accessing charging station, 33.6% users are somewhat convenient in accessing the charging station, 32.7% users are not very convenient in accessing charging station and 10% users are not convenient at all in accessing the charging station.

It is inferred that 33.6% respondents are somewhat convenient in accessing the charging station.

TABLE NO.4.14

CONCERN ABOUT AVAILABILITY CHARGING STATION

Availability of charging station	No of respondents	Percentage
Very concerned	25	22.7
Somewhat concerned	36	32.7
Not very concerned	22	20.0
Not concerned at all	27	24.5
Total	110	100.0

The above table shows the concern about the charging station, out of 110 respondents, 22.7% are very concerned, 32.7% are somewhat concerned, 20% are not very concerned and 24.5% are not concerned at all.

It is inferred that 32.7% are somewhat concerned about availability of the charging station.

TABLE NO.4.15

TECHNICAL MALFUNCTION DURING CHARGING

Technical malfunction	No of respondents	Percentage
Yes	17	15.5
No	61	55.5
Sometimes	31	28.2
Always	1	0.9
Total	110	100.0

The above table shows the technical malfunction during charging, out of 110 respondents, 15.5% experienced technical malfunction, 55.5% have not experienced, 28.2% only experienced sometimes and 0.9% have experienced always.

Majority 55.5% respondents experienced technical malfunction sometimes.

TABLE NO. 4.17 EXPECTATION OF FUTURE EV MARKET

Future EV market	No of respondents	Percentage
Longer driving range	56	50.9
Improved charging Infrastructure	49	44.5
Greater variety of EV models	59	53.6
Increased government support	51	46.4

The above table shows the expectations of the future EV market, out of 110 respondents, 50.9% expects longer driving range, 44.5% expects improved charging infrastructure, 53.6% expects greater variety of EV models and 46.4% expects increased government support.

TABLE NO. 4.18

PREFERENCE TOWARDS PURCHASE OF NEXT ELECTRIC VEHICLE

Purchase of an electric vehicle	No of respondents	Percentage
Very likely	35	31.8
Somewhat likely	41	37.3
Not very likely	21	19.1
Not likely at all	13	11.8
Total	110	100.0

The above table shows the expectations of purchasing an electric vehicle, out of 110 respondents, 31.8% are very likely, 37.3% are somewhat likely, 19.1% are not very likely and 11.8% are not likely at all.

Mostly 37.3% of the respondents are somewhat likely to purchase an electric vehicle.

TABLE NO. 4.19 AWARENESS ON TAX CREDIT

TAX CREDIT	NO OF RESPONDENTS	PERCENTAGE
Aware	72	65.5
Not aware	38	34.5
Total	110	100.0

The above table shows that out of 110 respondents, 65.5% are aware of the tax credit and 34.5% are not aware of it.

Majority 65.5% are aware of tax credit.

TABLE NO. 4.28

EFFECTIVENESS OF GOVERNMENT POLICIES AND INCENTIVES

Policies and incentives	No of respondents	Percentage
Very effective	20	18.2
Somewhat effective	38	34.5
Not very effective	25	22.7
Not effective at all	27	24.5
Total	110	100.0

The above table shows that out of 110 respondents, 18.2% says very effective, 34.5% says somewhat effective, 22.7% says not very effective and 24.5% says not effective at all.

Mostly 34.5% says policies and incentives are somewhat effective.

4.1 DESCRIPTIVE STATISTICS

TABLE NO. 4.29

DIFFICULTIES FACED BY RESPONDENTS WHILE CHARGING

Difficulties while charging	Mean	Std. Deviation
Lack of charging station	2.77	1.743
Long time charging	3.55	1.193
Safety concern	3.65	1.302
Lack of knowledge on charging	3.38	1.341
Average	6.67	

From the above table it is seen that the highest mean of 3.65 indicates the agreeability of respondents towards the statement of safety concern and the lowest mean score 2.77 indicates the disagreeability towards lack of charging station. The average mean score of 6.67 implies that respondents agree to safety concern difficulties while charging station. It is observed that the respondents agree to the difficulties facing while charging.

TABLE NO. 4.30

FACTORS PREVENTING FROM NEXT PURCHASE OF EV

Factors	Mean	Std. Deviation
Limited driving range	3.36	1.549
Battery life	3.46	1.147

Cost	3.34	1.221
Lack of charging station	3.36	1.318
Limited variety	3.22	1.184
Safety	3.70	1.303
Average	10.22	

From the above table it is seen that the highest mean of 3.70 indicates the prevention of next EV purchase towards the statement of safety and the lowest mean score 3.22 indicates not preventing next EV purchase towards limited variety.

The average mean score of 10.22 implies that factors preventing the next EV purchase. It is observed that the respondents agree to the factors prevent from purchase of EV.

TABLE NO. 4.31 BARRIERS TO ADOPT AN EV

Barriers to adopt EV	Mean	Std. deviation
Driving range	1.70	0.954
Initial cost of purchasing	2.46	1.064
Maintenance and repair cost	2.97	1.200
Lack of knowledge on EV	2.94	1.396
Lack of technician	2.77	1.297
Battery life	2.92	1.434
Not safety	3.18	1.315
Average	2.70	

From the above table it is seen that the highest mean of 3.18 towards barrier to adopt an EV and the lowest mean score 1.70 indicates not a barrier to adopt an EV. The average mean score of 2.70 implies that barriers to adopt an electric vehicle. It is observed that the respondents agree to the barrier to adopt an electric vehicle.

4.2 GARRET RANKING ANALYSIS

TABLE NO. 4.32 EXPECTATIONS WHILE PURCHASING NEXT EV

Factors	Rank 1	Rank 2	Rank 3	Rank 4	Rank 5
Acceleration	19	8	20	18	45
Range anxiety	13	17	31	32	17
Safety features	13	9	25	21	42
Remote monitoring	9	13	28	25	35

Autonomous driving	19	25	30	10	26
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Factors	1	2	3	4	5	Total	Average Score	Rank
Acceleration	1425	480	1000	720	1080	4705	42.77	III
Range anxiety	975	1020	1550	1280	408	5233	47.57	II
Safety features	975	540	1250	840	1008	4613	41.93	V
Remote monitoring	675	780	1400	1000	840	4695	42.68	IV
Autonomous driving	1425	1500	1500	400	624	5449	49.53	I

From the above table, autonomous driving is ranked first in the expectation while purchasing an electric vehicle by respondents with an average score of 49.53 and safety features is ranked fifth in the expectation while purchasing an electric vehicle.

5.SUGGESTIONS

- The study suggests that the users prefer subscription/membership method to pay for charging station. The major barriers in adopting Electric Vehicles are limited variety, lack of charging station.
- The government must improve the charging networks to increase in usage of Electric Vehicle.
- The users expectation of future Electric Vehicle markets are improved charging infrastructure and greater and longer driving range.
- The study suggests that the users expect autonomous driving and range anxiety while purchasing next Electric Vehicle.

6.CONCLUSION

Based on our comprehensive study on barriers to the adoption of electric vehicles (EVs), it is evident that several factors impede widespread acceptance. These barriers include concerns regarding charging infrastructure, limited driving range, higher initial costs, and consumer perceptions about EV performance. However, through targeted policies, technological advancements, and increased public awareness, these obstacles can be gradually overcome. By addressing these challenges, we can facilitate the transition towards a more sustainable transportation system powered by electric vehicles, ultimately benefiting the environment and society as a whole.

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