CONSUMER PERCEPTION TOWARDS ELECTRIC VEHICLES

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ABSTRACT

The objective of the study was to examine consumer perceptions towards electric vehicles (EVs) and evaluate the factors influencing their decision to purchase an EV. The study also aimed to identify the factors that discourage consumers from buying EVs and assess their purchase intention. The research methodology employed was quantitative in nature, using a descriptive research design. Data was collected through a questionnaire administered via Google Forms, which included close-ended questions and Likert scale questions. The sample consisted of around 170 respondents, selected through convenience sampling techniques. The findings of the study revealed that the majority of respondents had a positive perception towards electric vehicles. The most important perception among the majority was that EVs are cheaper to run. The main factor that encouraged customers to buy an EV was its eco-friendly nature, while the main factor that discouraged them was a lack of education about EVs. Respondents were found to be environmentally conscious, with a belief that air pollution is less with EVs compared to traditional vehicles.

Keywords: Consumer Perception, Electric Vehicles and Purchase Decision

INTRODUCTION

The automotive industry has witnessed a significant shift towards electric vehicles (EVs) in recent years. With advancements in technology and growing concerns about environmental sustainability, EVs have gained popularity as an alternative to traditional gasoline-powered vehicles. Consumer perception towards electric vehicles plays a crucial role in the widespread adoption of this new mode of transportation. Understanding consumer attitudes, preferences, and concerns regarding EVs is essential for automakers, policymakers, and other stakeholders to effectively promote and support the transition to a sustainable transportation system.

Consumer perception encompasses various aspects such as beliefs, attitudes, opinions, and behaviors towards a particular product or service. In the case of electric vehicles, it involves how consumers perceive EVs in terms of their performance, range, charging infrastructure, costs, environmental impact, and overall desirability as a mode of transportation. These perceptions can be influenced by a range of factors, including personal experiences, social influences, marketing and advertising campaigns, and government policies.

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Over the past decade, there has been a notable shift in consumer perception towards electric vehicles. Initially, EVs were often associated with limitations such as limited range, long charging times, and high purchase prices. However, as technology has advanced and automakers have introduced more affordable and practical electric models, consumer attitudes have started to change. The perception of EVs has evolved from being seen as niche or futuristic to being recognized as a viable and sustainable transportation option.

One of the primary drivers of positive consumer perception towards electric vehicles is the growing concern for environmental issues such as climate change and air pollution. EVs produce zero tailpipe emissions, which is an attractive feature for environmentally conscious consumers. Additionally, the development of renewable energy sources and the increased availability of charging infrastructure have alleviated concerns about the practicality of EVs for daily use.

Another significant factor influencing consumer perception is the advancement in battery technology, leading to improved range and performance of electric vehicles. Modern EVs can now offer comparable range and acceleration to their gasoline-powered counterparts, alleviating concerns about limited driving distances and sluggish performance.

However, challenges still exist in terms of consumer perception. Some common concerns include the availability of charging infrastructure, the time required for charging, the upfront cost of electric vehicles, and the potential for battery degradation over time. Addressing these concerns and providing accurate information to consumers is crucial in building trust and confidence in electric vehicles.

LITERATURE REVIEW

Consumer preferences for electric vehicles: by Fanchao Liao, Eric Molin & Bert van Wee, Widespread adoption of EVs may contribute to lessening of problems like environmental pollution, global warming and oil dependency. However, this penetration of EV is comparatively low in spite of governments implementing strong promotion policies. They presented a comprehensive review of studies on consumer preferences for EV aiming to convey policy-makers and give direction to further research. (Fanchao Liao, 2017).

"The role of environmental concerns, social norms, and product attributes in influencing consumer intentions to purchase electric vehicles" by **Miguel A. Gomez and Amir H. B. Nasution (2021)** - This study examines the influence of environmental concerns, social norms, and product attributes on consumer intentions to purchase EVs, finding that environmental concerns and product attributes have the greatest impact.

"Electric vehicle adoption: How government policy and industry strategy interact" by **Rachel Finn and Charles Graham (2022)** - This study explores the interplay between government policies and industry strategies in promoting EV adoption, finding that government policies can stimulate industry investment in EV technology.

"An investigation of consumer preferences for electric vehicles using choice experiments" by **Tao Huang, Xinyu Cao, and Xiaoyu Yan (2022)** - This study uses a choice experiment to examine consumer preferences for EVs, finding that consumers are

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willing to pay more for EVs with longer ranges and faster charging times.

The study **"Modelling load shifting using electric vehicles in a smart grid environment"** by Shin-ichi Inage in OECD, 2022. This study proposes a method for simulating the potential benefits of using EVs in load shifting and "vehicle-to-grid" applications for four different regions – the United States, Western Europe, China and Japan – that are expected to have large numbers of EVs by 2050.

OBJECTIVE OF THE STUDY

➢ To study the consumer perception towards Electric Vehicle
➢ To evaluate the factors influencing the consumers to buy EV
➢ To examine the factors which discourage the consumer to buy EV
➢ To assess the purchase intention of EV

SCOPE OF THE STUDY

This study has focused on both primary and secondary data of electric vehicles in India. Though the research found a potential scope of Electric vehicles in India, still there is a scope for in-depth study with greater number of samples and more factors.

RESEARCH METHODOLOGY

Research design

Quantitative research is the process of collecting and analyzing numerical data. It can be used to find patterns and averages, make predictions, test causal relationships, and generalize results to wider populations. The study is guided by a descriptive research methodology. Descriptive research is usually defined as a type of quantitative research, though qualitative research can also be used for descriptive purposes. The research design is developed to ensure that the results are valid and reliable. Survey research which is one of the methods of descriptive research which is employed to gather large volumes of data that can be analyzed for frequencies, averages and patterns.

Data Collection

Data collection is characterized by standard validated techniques as the method of gathering, measuring and analyzing accurate insights for study. The most important goal of data collection is to ensure that data-rich and accurate data is obtained for statistical analysis in order to make data-driven research decisions.

Primary Data

Primary data is information obtained from first-hand sources by a researcher, using techniques such as surveys, interviews, or experiments. It is compiled, straight from primary sources, with the research project in mind. In comparison with the term secondary data, the information already present is used.

Secondary Data

Secondary data refers to knowledge that is gathered by someone other than the user. Censuses, data gathered by government agencies, operational records and data originally gathered for other research purposes are popular sources of secondary data for social science.

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Research Instrument

Research instrument adopted in the research is "questionnaire" which was convenient and helpful in obtaining the responses from the respondents. The questionnaire in the form of Google Forms is used. Questionnaire consists of a number of close ended questions and Likert scale question were also designed in a particular order.

Sample

A sample, as the name applies, is a smaller representation of larger whole. The selected respondents constitute what is technically called a sample and the selection process is called sampling.

Sample Technique

The process of selecting a smaller group of participants to tell us essentially what a larger population might tell us if we asked every member of the larger population the same questions. **Convenience sampling** techniques that helps in saving time and resources is the Convenience sampling.

Sample size

The number of people in your survey depends on the population size and how accurately you want the findings to reflect the population as a whole. It refers to the number of sampling units selected from the universe for investigation. The sample size of around 170 respondents has been taken.

Sample Unit

Sampling unit are walk-in customers of the show room and general public.

Tools used for analysis: Percentage analysis, One way Anova, Cross tabulation, Chi square, Correlation and Regression

LIMITATIONS OF THE STUDY

Impact of customer relationship management for surveys and customer analytics is powerful tools for evaluating the marketing performance of companies: but they also have limitation of surveys and customer analytics.

1. The study may have limitations in terms of the representativeness of the sample. For example, the study may have only included customers from a specific demographic, geographic region, or industry, which may limit the generalizability of the findings.

2. Due to limitation of time only few people were selected for the study. So the sample of consumers was not enough to generalize the findings of the study

3. Getting response from busy consultancies for our project and research work was little difficult as most of them denied sharing their internal data or information.

4. The study involve some organizations and people in the research, and sometimes you may get problems with access to these organizations. Due to this, you need to redesign and rewrite your study.

ANALYSIS AND INTERPRETATION

Demographic variables of the respondents

Demographic variables	Particulars	Frequency	Percent
	18-24	71	43.8
Age	24-34	30	18.5

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	34-44	27	16.7
	44-54	20	12.3
	54-64	8	4.9
	Above 64	6	3.7
	Total	162	100
	Male	104	64.2
	Female	58	35.8
Gender	Total	162	100
	No formal education	4	2.5
	High school or below	28	17.3
	Bachelor's degree	88	54.3
	Master's degree	38	23.5
Educational	Doctorate degree	4	2.5
Qualification	Total	162	100
	Public Company	20	12.3
	Private company	53	32.7
	self employed	42	25.9
	Unemployed	47	29
Employment Status	Total	162	100
	Less than 25000	28	17.3
	25000-50000	47	29
	50000-100000	36	22.2
	Above 100000	7	4.3
	Unsalaried	44	27.2
Income	Total	162	100
	Single	89	54.9
	Married	73	45.1
Marital Status	Total	162	100
	Nuclear family	112	69.1
	Joint family	50	30.9
Type of family	Total	162	100

Age:

The majority of the respondents fall within the age range of 18-24, accounting for 43.8% of the total.

The second largest age group is 24-34, comprising 18.5% of the respondents.

The distribution gradually decreases as the age increases, with the lowest representation among respondents above 64 years (3.7%).

Overall, the age distribution of the respondents is fairly diverse.

Gender:

Among the respondents, 64.2% identify as male, while 35.8% identify as female. The survey includes a relatively higher number of male participants compared to female participants.

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Educational Qualification:

The highest proportion of respondents, at 54.3%, have a Bachelor's degree, indicating a significant number of individuals with undergraduate education. The second largest group consists of respondents with a Master's degree, accounting for 23.5% of the total. A smaller percentage of respondents have either no formal education (2.5%), a high school education or below (17.3%), or a doctorate degree (2.5%).

Employment Status:

The respondents' employment status reveals a diverse mix of individuals. The largest group, at 32.7%, is employed in private companies, followed closely by self-employed individuals at 25.9%. Public company employees make up 12.3% of the respondents, while 29% report being unemployed.

Income:

Among the respondents, the largest segment falls in the income range of 25000-50000 (29%). 17.3% of respondents report an income of less than 25000, while 22.2% fall within the range of 50000-100000. Only a small proportion of respondents have an income above 100000 (4.3%), and 27.2% indicate being unsalaried.

Marital Status:

The majority of respondents, 54.9%, report being single, while 45.1% indicate being married. The survey includes a higher representation of single individuals compared to married individuals.

Type of Family:

A significant majority of respondents, 69.1%, belong to nuclear families. Joint families, which involve living with extended family members, make up 30.9% of the respondents. The survey primarily includes respondents from nuclear family setups.

Perception towards Electric Vehicle:

Figure Showing the Perception towards Electric vehicle
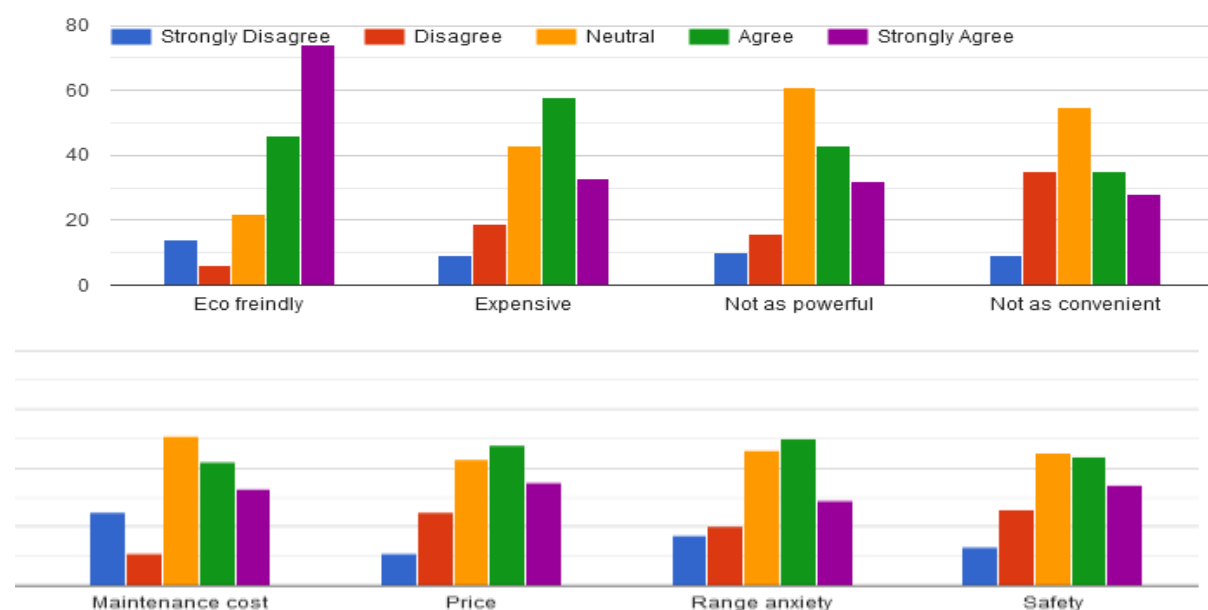
Interpretation:

1. Eco friendly -Nearly 80% of people **Strongly agree** that EV are eco friendly when

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compared with Traditional Vehicle.

2. Expensive   - Nearly 60% of people **Agree** that EV are Expensive when compared with Traditional Vehicle.

3. Not as powerful - 60% of people opted **Neutral** that EV are not as powerful when compared with Traditional Vehicle.

4. Not as convenient - Nearly 60% of people opted **Neutral** that EV are not as convenient when compared with Traditional Vehicle.

5. Maintenance Cost -50% of people opted **Neutral** that EV are maintenance cost when compared with Traditional Vehicle.

6. Price -   Nearly 50% of people **Agree** that EV are costly when compared with Traditional Vehicle.

7. Range Anxiety - 50% of people **Agree** that EV will not have enough battery charge to reach destination when compared with Traditional Vehicle.

8. Safety – Nearly 40% of people opted **Neutral** that EV are safer when compared with Traditional Vehicle.

Perception towards Range of Electric Vehicle

Kilometers can an average EV travel on a charge according to you

Particulars	Frequency	Percent
Less than 100 km	25	15.4
100-200 km	32	19.8
200-300 km	60	37
300-400 km	34	21
More than 400 km	11	6.8
Total	162	100

The above table shows that 15.4% of the respondents have perception about range of Electric vehicles less than 100km, 19.8% of the respondents have perception about range of Electric vehicle between100 - 200km, 37.0% of the respondents have perception about range of Electric vehicles between 300 - 400km, 6.8 % of the respondents have perception about range of Electric vehicles more than 400km

Anova :

Comparison between perception of respondents towards EV's compared to traditional vehicles

Ho1: Significant difference exists between perception of respondents towards EV's compared to traditional vehicles

Interpretation:

1. Expensive : The significant value = 0.549 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

2. Not as convenient : The significant value =   0.110 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

3. Not as powerful : The significant value =   0.384 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

4. Maintenance cost: The significant value =   0.835 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

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5. Price: The significant value = 0.511 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle
6. Range Anxiety: The significant value = 0.411 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle
7. Safety: The significant value = 0.509 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

Cross Tabs

Perception towards EVs compare towards the Traditional vehicles [Eco freindly] * Age Cross tabulation

		Age						Total
		18-24	24-34	34-44	44-54	54-64	Above 64	Total
Perception towards EVs compare towards the Traditional vehicles [Eco friendly]	Strongly Disagree	13	1	0	0	0	0	14
	Disagree	4	2	0	0	0	0	6
	Neutral	11	4	2	3	2	0	22
	Agree	16	10	9	6	2	3	46
	Strongly Agree	27	13	16	11	4	3	74
Total		71	30	27	20	8	6	162

Interpretation

Most of the Customers between ages 18-24 **Strongly Agree** that EV are Eco Friendly when compared with traditional vehicle.

Chi-Square Tests:

Perception towards EVs compare towards the Traditional vehicles [Eco freindly] * Age

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	25.035[a]	20	.200
Likelihood Ratio	31.340	20	.051
Linear-by-Linear Association	12.397	1	.000
N of Valid Cases	162		

Interpretation:

Eco friendly: The significant value = 0.200 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

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Perception towards EVs compare towards the Traditional vehicles [Expensive]

		Educational Qualification	Perception towards EVs compare towards the Traditional vehicles [Expensive]
Correlations			
Educational Qualification	Pearson Correlation	1	-.053
	Sig. (2-tailed)		.503
	N	162	162
Perception towards EVs compare towards the Traditional vehicles [Expensive]	Pearson Correlation	-.053	1
	Sig. (2-tailed)	.503	
	N	162	162

Interpretation:

The significant value = .503 > P. So accept null hypothesis. Therefore there is no significant difference between Educational qualification and perception towards EV (Expensive) over traditional vehicle.

Regression:

Dependent variable: perception towards Electric vehicles compare towards the traditional vehicles [eco friendly]

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
					Change Statistics				
1	.052[a]	.003	-.004	1.238	.003	.435	1	160	.510

a. Predictors: (Constant), Income (monthly)

Coefficients[a]

Model		Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
1	(Constant)	4.118	.220		18.692	.000
	Income (monthly)	-.044	.067	-.052	-.660	.510

a. Dependent Variable: Perception towards EVs compare towards the Traditional vehicles [Eco friendly]

Interpretation:

1. The R value is .052 and R Square value is .003
2. Y = 4.118 + (-0.44) x
3. Income and Perception towards EVs compare towards the Traditional vehicles [Eco friendly] are Negatively correlated.

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FINDINGS OF THE STUDY

1. Majority of the respondents have positive Perception towards electric vehicle.
2. Most important perception among the majority is that electric vehicle are cheaper to run.
3. The main factor that encourages customers to buy an electric vehicle is Eco Friendly.
4. The main factors that discourage customers to buy an electric vehicle is that they are not educated enough on electric vehicle.
5. The respondents are found environmentally conscious since most of them responded that air pollution is less in comparison with Traditional vehicles.

Percentage Analysis:

1. Educational level - 2.5% of the respondents have No formal education 17.3% of the respondents High School or Below, 54.3% of the respondents Bachelors degree, 23.5% of the respondents Masters Degree, 2.5% of the respondents Doctorate degree.
2. Employment status - 12.3% of the respondents work in Public company 32.7% of the respondents work in Private company, 25.9% of the respondents are self employed, 29.0% of the respondents are Unemployed, 2.5% of the respondents Doctorate degree.
3. Income level -17.3% of the respondents income level Less than 25000, 29.0% of the respondents income level between 25000-50000, 22.2% of the respondents income level between 50000-100000, 4.3% of the respondents income level Above 100000, 27.2% of the respondents are Unsalaried.
4. Marital status - 54.9% of the respondents are single, 45.1% of the respondents are Married.
5. Family type - 69.1% of the respondents are Nuclear family, 30.9% of the respondents are Joint family.
6. 60.5% of the respondents have four wheelers, 39.5% of the respondents doesn't have four wheelers.
7. 69.8% of the respondents purchased four wheelers less than 5 years, 21.0% of the respondents purchased four wheelers between 5 -10 years, 9.3% of the respondents purchased four wheelers between 10 -15 years
8. Fuel option - 38.3% of the respondents have diesel as a fuel option, 49.4% of the respondents have Petrol as a fuel option, 4.9% of the respondents have Gasoline as a fuel option, 7.4% of the respondents have Electric Vehicle as a fuel option
9. Knowledge about Electric vehicles 92.6% of the respondents have knowledge about Electric Vehicle, 7.4% of the respondents doesn't have knowledge about Electric Vehicle.
10. 32.7% of the respondents have driven Electric Vehicle, 67.3% of the respondents haven't driven Electric Vehicle.
11. 69.4% of the respondents consider purchasing an electric vehicle in near future, 30.9% of the respondents not consider purchasing an electric vehicle in near future
12. Most number of the respondents (37.0%) have perception about range of Electric vehicles between 300 - 400km
13. Most number of the respondents (39.5%) perceived cost of charging was About the same compared to Traditional vehicle

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14. Most number of the respondents (54.3%) perceived within 5 years Electric vehicles become mainstream

15. Most number of the respondents (49.4%) perceived it will take 2 - 4 hrs to charge an Electric vehicle

16. Most number of the respondents(77.2%) opted that to purchase EV for the reason of its environmental friendly nature

17. Most of the Customers between ages 18-24 **Strongly Agree** that EV are Eco Friendly when compared with traditional vehicle.

18. Among Male most of the Customers **Strongly Agree** that EV are Eco Friendly when compared with traditional vehicle.

ANOVA:

1. Expensive : The significant value = 0.549 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

2. Not as convenient : The significant value = 0.110 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

3. Not as powerful : The significant value = 0.384 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

4. Maintenance cost: The significant value = 0.835 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

5. Price: The significant value = 0.511 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

6. Range Anxiety: The significant value = 0.411 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

7. Safety: The significant value = 0.509 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

Cross Tabulation:

1. Most of the Customers between ages 18-24 **Strongly Agree** that EV are Eco Friendly when compared with traditional vehicle.

2. Most of the Customers between ages 18-24 **Strongly Agree** that EV are Expensive when compared with traditional vehicle.

3. Most of the Customers between ages 18-24 **Agree** as well as opted Neutral that EV are safety when compared with traditional vehicle.

5.1.4 Chi Square:

1. Eco friendly: The significant value = 0.200 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

2. Price: The significant value = 0.097 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle

3. Safety: The significant value = 0648 > P. So accept null hypothesis. Therefore there is no significant difference between EV and Traditional vehicle.

Correlation:

1. The significant value = .087 > P. So accept null hypothesis. Therefore there is no significant difference between Educational qualification and perception towards EV (Eco friendly) over Traditional vehicle.

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2. The significant value = .50 > P. So accept null hypothesis. Therefore there is no significant difference between Educational qualification and perception towards EV (Expensive) over Traditional vehicle.

3. The significant value = .322 > P. So accept null hypothesis. Therefore there is no significant difference between Educational qualification and perception towards EV (Price) over Traditional vehicle.

4. The significant value = .418 > P. So accept null hypothesis. Therefore there is no significant difference between Educational qualification and perception towards EV (Safety) over Traditional vehicle.

5. The significant value = .510 > P. So accept null hypothesis. Therefore there is no significant difference between Income (monthly) and perception towards EV (Eco friendly) over Traditional vehicle.

6. The significant value = .249 > P. So accept null hypothesis. Therefore there is no significant difference between Income (monthly) and perception towards EV (Expensive) over Traditional vehicle.

7. The significant value = .982 > P. So accept null hypothesis. Therefore there is no significant difference between Income (monthly) and perception towards EV (Price) over Traditional vehicle.

8. The significant value = .477 > P. So accept null hypothesis. Therefore there is no significant difference between Income (monthly) and perception towards EV (Safety) over Traditional vehicle.

Regression:

1. Income and Perception towards EVs compare towards the Traditional vehicles [Eco friendly] are negatively correlated.

2. Income and Perception towards EVs compare towards the Traditional vehicles [Expensive] are negatively correlated.

3. Income and Perception towards EVs compare towards the Traditional vehicles [Price] are negatively correlated.

4. Income and Perception towards EVs compare towards the Traditional vehicles [Safety] are positively correlated.

SUGGESTION:

1. Still consumers doesn't have knowledge about the electric vehicle, so have to improve advertisement or change the advertisement strategy

2. Most of the consumers doesn't drive Electric vehicles so improve test drive among consumer to gain more knowledge and experience about the Electric vehicles.

3. Most of the consumers are ready to purchase the Electric vehicles but the factors such as Charging station, safety, etc reduce the impulse to buy Electric vehicle. If they have clear view around these areas they will buy Electric vehicles.

4. The consumers perceives that the Electric vehicles will become mainstream within 5 years, so they are ready to adopt to the EV

5. After conducting the research and looking into the current scenario, it is suggested to make a proper availability of infrastructure from the companies so that they can cater to the requirements of the EV Vehicles all over the country.

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CONCLUSION

The current state of the EV Industry is in a great position with future prospects and a huge market share as the quality of products has evolved a lot since the beginning of the EV in India. The perception of the Indian consumers have started to adopt technological improvements where Electric vehicles gain an upper hand over Traditional vehicle. The findings of the study established that there is good perception towards buying an electric vehicle. One of the factors limit the buying of an EV was lack of knowledge of customers towards electric vehicles. In this research as we got relevant information from the customers. So this research study concluded that the customers have a positive perception towards electric vehicles.

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