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Research Article

Electric Vehicle

Consumer's Perception towards Green Transportation and its Impact on Sustainability

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In our worldwide competitive environment, a few percentages of vehicles sold in India are generally Electric. The purpose of the current study is to examine the hindrance of influencing consumer's intension to adapt sustainable Electric Vehicle (EV) based on their habitual or purchasing behavior frequency. The Indian Government has made several numerous attempts to promote and ensure a fruitful introduction to Electric Vehicle through out PAN India level. Concerning environmental awareness has also been appreciated the new development of innovative Bio-Friendly Vehicles other than traditional Gasoline vehicles. The Objective of the study is to ascertain the consumer perception towards the adaption of Electric Vehicles. In this paper we have used two variables namely Dependent & Independent variables. On such basis Consumer Perception will be a dependent variables, in another side Government Initiative Towards promoting of EV, Affordability of Consumers towards adaption of EV, Awareness with the concern of Environmental factor will be considered as Independent Variables. A Sample of Fifty-Seven (57) responses were collected for this study based on structural questions given to the respondents. This Study displayed the significance the two pair of combinations on the dependent variable that is consumers' perception. The Objective of our study is to evaluate is there any significant impact of such combinations and which one of the combinations is/are most likely affect or the highest significant factor on the consumers' perception by applying different statistical tool. The tools we have used Correlation Co-efficient in a combination of independent variables and we have reached a standpoint how consumers will react towards the adoption of EV and its sustainability.

Keywords: electric vehicle (ev), gasoline, sustainability, correlation, co-efficient, affordability

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1. Introduction

In our modern urban life environmental degradation increases day by day. There are various reasons due to which our nature is being exhausted. One of the major reasons is air pollution. Out of the various reasons of air pollution, the reason that has huge effect is due to carbon emission from different vehicles. As much as urbanisation increases requirement of transport medium also get increased. We cannot avoid it. To lead our life smooth, we need these facilities. But what about the environment. Can we do nothing about this aspect. As rapid increase of transport will affect more the environment through air pollution. In many way environmental sustainability can be maintained. Because we cannot hamper our future for the shake of benefits in the present. So, we need a concrete solution to this problem in such a way that without any harm to the environment we can pursue our objectives. In this way the invent of electric vehicles can somehow solve the problem. But it is not so easy to implement a new transport option. Again, in spite of implementation there are various hurdles in the adoption of such system. These has been discussed in our study by specifying various attributes relating to this matter.

2. Significance of the Study

The introduction of electric vehicle (EV) over traditional transport medium is a necessity for blocking environment pollution and to attain sustainability. But there is various mind-set of consumer/ passenger that impacts adoption of electric vehicles. There may be Govt. initiatives towards promotion of sustainable vehicles but are consumers aware of such schemes or not. Again, suppose passengers are aware about the scheme but if it is affordable to adopt such medium. So it can be seen that a pair of combination fell impact on consumers regarding their perception towards adoption of green vehicle.

3. Literature Review

1. In this study the author shown a detailed analysis of the power consumption pattern of different transportation medium during the time of 1980-81 to 1993-94. Various transportation mediums are being separately classified by different types. Changes in the number of vehicles were shown for each year.

In the conclusion part details of Electric vehicles was given but that is not so much comprehensive. The analysis was not also very lucid for understanding. (Ramanathan, 1999)

2. The study is a showcase of different aspect of transport system. Here various segments connecting to a transport system was analysed. How much pollution is being caused by different transport medium was shown. Besides scenario of sustainable transportation adaptability by different developing country was also shown. Again, total length of Roads constructed from 1990-91 to 2016-17 was also analysed. And traffic congestion of top 10 cities over the globe were shown focusing on the Indian context. (Mahapatra & Mohanachandran, 2023)

3. The study is very specific about the problem of pollution caused by different diesel-powered vehicles in India. As in each of the metro city traffic congestion is very high so pollution also increases day by day. As a part of remedy introduction of E-rickshaw and commercialisation of it can be a significant move towards sustainable transport implementation. The future prospects of such medium were also shown in this study. (Rajvanshi, 2002)

4. The study expressed some interesting and important facts about the public transport system in Bengaluru. Different Segment of transportation were shown and also the revenue generation from each segment was also given. More focus was given on existing and proposed metro lines from the point of view of environment-friendly and consumer pocket friendly. In the analysis part different utility functions were shown regarding different variables. Again, sectorial revenue generation of state government was also analysed with suitable graphical analysis. The objective was to improve the efficiency of public transportation system. (Vajjarapu & Karmakar, 2019)

5. This Study may create environmental awareness and self-identification expensiveness into value-based adaption model (VAM). It is more significant and impact on perceived value and usefulness of EV adaption towards the benefits of decision making process. (Mustafa, Shi, & Wen Luo, 2024)

6. In this study researcher applied UTATU2 model to examine the factors affecting EV Adaption among Indian Commuters. It includes performance expectancy, social influence and facilitating conditions which may influence their adaption intention ions towards EV.(Attri & Kushwala, 2024)

7. In this paper author examined the psychological factors that may affect Indian customers towards the adaption of Electric vehicle. Identify the lifestyle which may significantly influence the attitudes, which turn into purchase intention & Ecological behavior. The social factors might play a more substantial psychological perception. (Singh & Sadhu, 2023)

4. Research Gap

By reviewing the existing literature, we can see that each paper was focused on a particular aspect. In a paper the data is not up to date, in another paper the analysis is not in lucid manner. Some paper described about the scenario of existing public transport system. In few paper the pollution caused by diesel-powered vehicles due to traffic congested was also discussed. The adoption of sustainable transport system was also recommended. But mere recommendation is not sufficient to adopt any new system. In this view, we have used some attributes that make impact on consumers regarding adoption of electric vehicles. Both the public and private transport are being considered in our study which was also not so much precisely available in our literature review. From such view, our study will provide some new insights about this emerging topic.

5. Objective of the Study

1. To know that the Government initiatives towards initiation of Electric Vehicle (EV) over the different cities.
2. To recognize about the perception of Consumer towards EV adaption.
3. To know about the Interconnectedness between Consumer Perception and Government Initiatives, Affordability, Awareness concerning EV.

6. Research Methodology

We have selected Electric Vehicles (EV) over Traditional Gasoline vehicles. The data has been collected from primary data survey. The details of data collection are as follows:

Sample Size: We have collected sample size of Fifty-Seven (57) for primary data analysis which is essential for our research paper. As in our research paper the objective of our study is concerned with detection of the perception of the consumer towards EV and it is very prevalent now a days. The opinion of the respondents is very significant towards their concern in Environmental Awareness and Sustainability.

Justification of Considering Sample Size: This Study is based on Primary Data survey, for which collecting of 57 responses, which while in modest in number is sustainable for the exploratory scope of research. The focus of the study is to gain primary insights inro environmental impact and sustainability of green transportation. The sample size aligns with previous exploratory studies in this domain, where target samples have provided for insightful findings. In addition to respondents were selected based on their relevance to the topic, ensuring that the data collected remaining focused and informative. Further Research can expand their work in this area by incorporating the large and more diverge participants base to validate and generalize their findings.

Sample Area: Kolkata, Howrah, Grater Kolkata, Amta, Belur, Canning Town, Haldia, Durgapur, etc. This survey is limited to some areas in Urban & Semi-urban Areas the consumers are still preferred Gasoline Vehicles over EV.

Data Collection: Structured Questionnaire through Google Form.

Data Collection Period: 20th Feb 2025 to 27th Feb 2025.

In this set of questionnaires, we have framed total Nine (09) Questions covering all the traits of Independent variables. Therefore, it can be a clear understanding that the dependent variable (i.e. Consumers' Perception) how dependent variable will be affected. Every set of questions has been followed by a Likert Scale of measurement of FivePoint Basis. [i.e. Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A), Strongly Agree (SA)].

Independent Variables:

(a) Government Initiatives towards Promoting of EV (IV 1)

(b) Affordability of Consumers' (IV 2)

(c) Awareness of the consumers with regard to Green vehicles Impact on Environment (IV 3)

Dependent Variable: Consumers' Perception

Different Measurements of Likert Scale:

1. Point I: Strongly Agree (SA)
2. Point II: Agree (A)
3. Point III: Strongly Disagree (SD)
4. Point IV: Disagree (D)
5. Point V: Neutral (N)

For Each Independent variable (IV) there are three questions. So that we can cumulate the responses for each question as well as answering choices. Then the total Responses will be shown as given below:

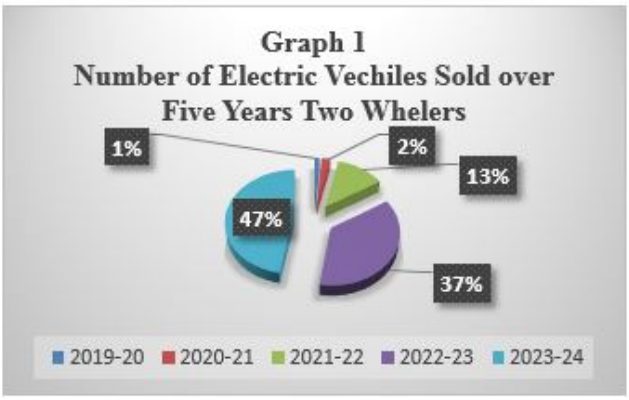
Combination I: [Government Initiatives towards Promoting of EV (IV 1) + Awareness of the consumers with regard to Environment (IV 3)]

Combination II: [Affordability of Consumers' (IV 2) + Awareness of the consumers with regard to Environment (IV 3)]

The Objective of our study is to evaluate is there any significant impact of such combinations and which one of the combinations is/are most likely affect or the highest significant factor on the consumers' perception by applying different statistical tool. As the Correlation test the "R" value lying in between -1 to +1.

7. Data Analysis & Findings

(a) Graphical Presentation:



1. In India Number of Electric Vehicles Sold Over preceding Five Years

Table 1: Number of Electric Vehicles Sold Over Five Years

Year	Two Whelers	Three Wheelers	Four Whelers
2019-20	26834	143051	2337
2020-21	44803	90898	5154
2021-22	252642	172543	18622
2022-23	728054	401882	47499
2023-24	944126	632485	90432

Data Source: smev.in/statistics

Interpretation: In the above table I, the data shows number of EV sold over last financial years. Considering two wheelers, in 2023-24 total number of EV sold 944126 which is significantly higher than 2022-23 followed by 2021-22. In the other side the equivalent object will be considered for Three and Four wheelers.

2. Number of Electric Vehicles Sold over few states in India

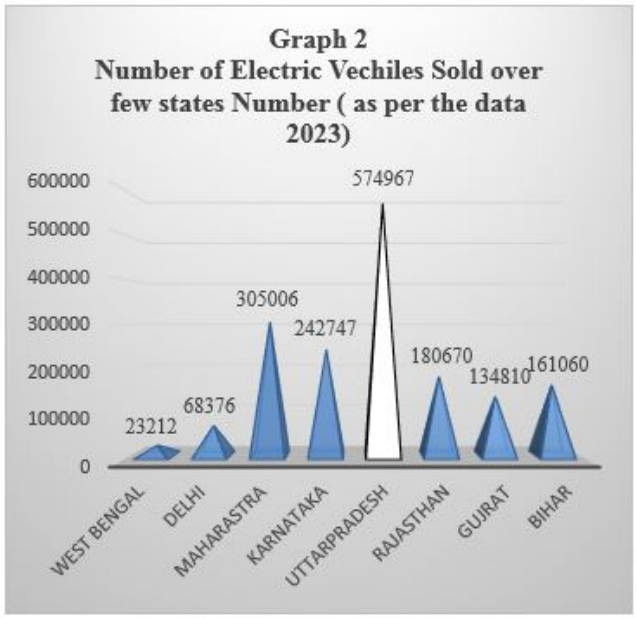


Table 2: Number of Electric Vehicles Sold over few states

State	Number (as per the data 2023)
West Bengal	23212
Delhi	68376
Maharastra	305006
Karnataka	242747
Uttarpradesh	574967
Rajasthan	180670
Gujrat	134810
Bihar	161060

Data Source: pib.gov.in/press release

Interpretation: In the above table 2, the highest number of EV sold in Uttarpradesh followed by Maharastra, Karnata, etc. As considering the Gujrat, Bihar, Rajashtan and other states which is significantly higher over the past few years.

3. Demographic Variable: (Data Collected from Sample Survey Questionnaire)

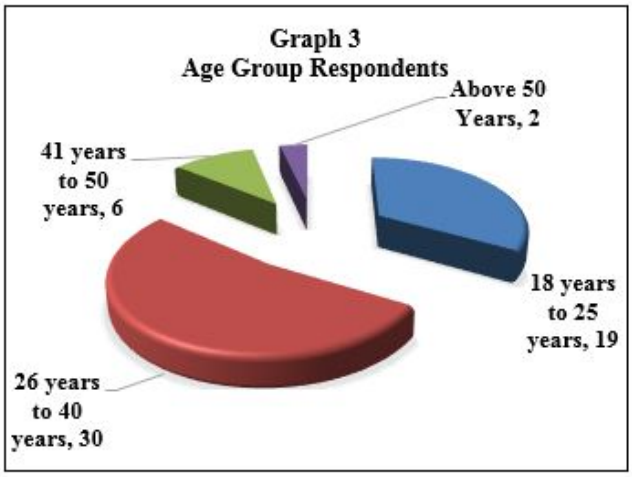


Table 3: Age Group	
Scale	Respondents
18 years to 25 years	19
26 years to 40 years	30
41 years to 50 years	6
Above 50 Years	2

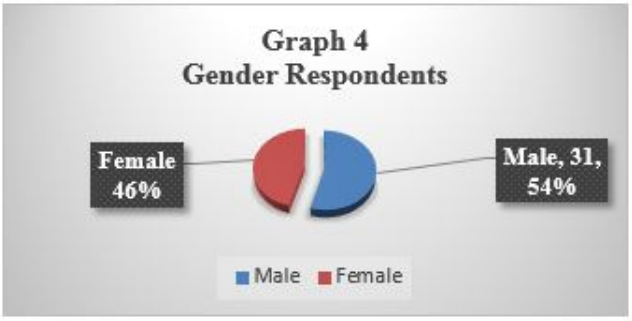


Table 4: Gender	
Scale	Respondents
Male	31
Female	26

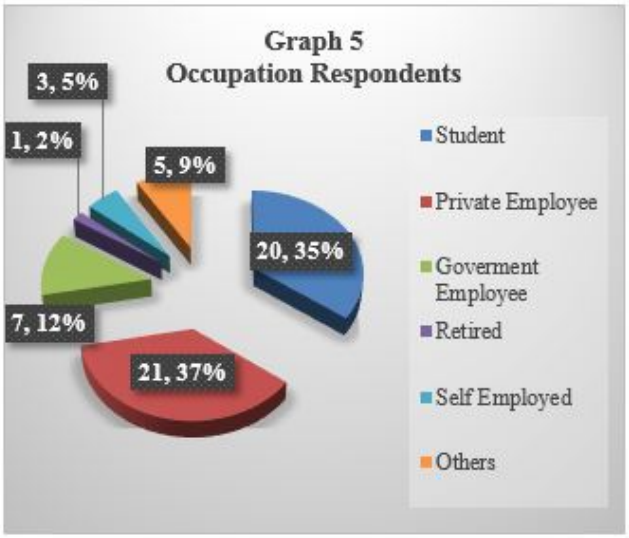


Table 5: Occupation	
Scale	Respondents
Student	20
Private Employee	21
Government Employee	7
Retired	1
Self Employed	3
Others	5

4. Are You Familiar with the Concept of Green transportation: (Question in Sample Survey)

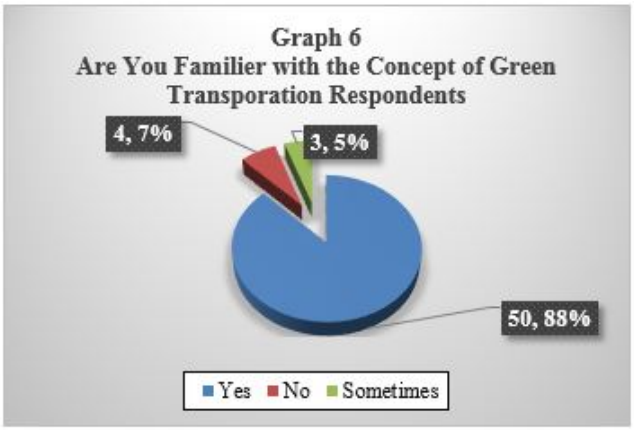


Table 6: Are You Familiar with the Concept of Green transportation	
Scale	Respondents
Yes	50
No	4
Sometimes	3

Interpretation: In the above table 6, Fifty Respondents are acquainted with the impression of Electric Vehicle out of Fifty-seven Respondents.

5. Do you believe Eco-Friendly Vehicles can significantly contribute to save the Environment: (Question in Sample Survey)

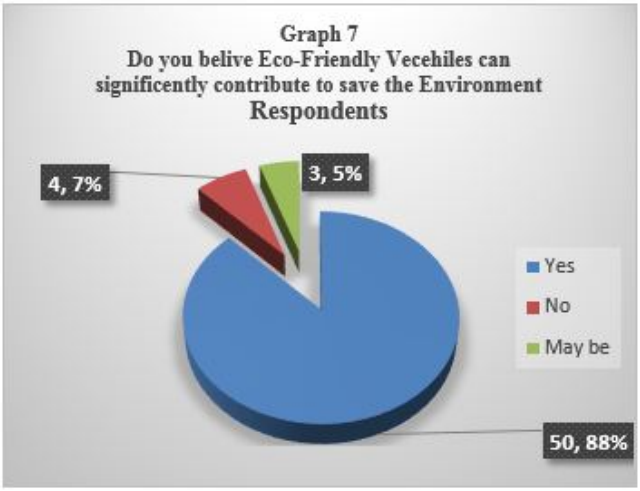


Table 7: Do you believe Eco-Friendly Vehicles can significantly contribute to save the Environment	
Scale	Respondents
Yes	50
No	4
May be	3

Interpretation: In the above table 7, Fifty Respondents (88%) are being believed that Eco-Friendly vehicles can significantly contribute to save the Environment.

(b) Descriptive Analysis:

The Study has three Independent variables and for Each Independent variables different number of questions have been constructed. Thereafter, for each Independent variable, to get the Cumulative response for each point of scale, the number of responses for each options has been augmented.

Here Independent variable 1 (IV 1) Government Initiatives towards promoting of EV , Table 8 Shows the total number of Responses under different options for each of the questions relating to this category.

Table 8: Shows Cumulative responses relating to IV 1:

Point of Scale	Number of Responses
Point I (Strongly Agree)	57
Point II (Agree)	93
Point III (Strongly Disagree)	04
Point IV (Disagree)	02
Point V (Neutral)	14

Source: Authors' Compilation

Here Independent variable 2 (IV 2) Affordability of the Consumer. Table 9 shows the total number of replies under the dissimilar options of each query relating to this type.

Table 9: Shows Cumulative responses relating to IV 2:

Point of Scale	Number of Responses
Point I (Strongly Agree)	55
Point II (Agree)	81
Point III (Strongly Disagree)	02
Point IV (Disagree)	08
Point V (Neutral)	25

Source: Authors' Compilation

Here Independent variable 3 (IV 3) Awareness of the Consumer towards concering to Environment & Sustainability.

Table 10 shows the total number of replies under the dissimilar options of each query relating to this type.

Table 10: Shows Cumulative responses relating to IV 3:

Point of Scale	Number of Responses
Point I (Strongly Agree)	43
Point II (Agree)	95
Point III (Strongly Disagree)	03
Point IV (Disagree)	08
Point V (Neutral)	22

Source: Authors' Compilation

Correlation Analysis:

As definite in our Research Methodology, different incorporations of Independent variables have been used to contemporary if there is any inter-connectedness between these variables to make an impact on Dependent Variable (i.e. Perception of the Consumer towards Environment & Sustainability Regarding the adoption of Electric Vehicle), this situation is perfectly pertinent & suitable by using the said statistical test.

In this paper we have done the Correlation in between two pair of combinations.

(a) Combination I: IV 1 & IV 3 (i.e. Govt Initiatives towards Promoting of EV & Consumer Awareness towards Environment)

Table 11: Shows Correlation between IV 1 & IV 3:

Correlation	IV 1	IV 3
IV 1	1	
IV 3	0.9767008	1

Source: Authors' Calculation

As per Correlation Analysis, the cor. Co-efficient in between IV 1 & IV 3 is 0.9767 which is positively correlated among the two variables, which may signify the same direction of movement. It means Government Initiatives towards promoting of Green Transportation through Electric Vehicles And Awareness of the Consumer towards Concerning to Environment will impact significantly on the Buying perception of Consumers'. Though this combination has positive impact on Consumers' Perception.

(b) Combination II: IV 2 & IV 3 (i.e. Affordability of Consumer & Consumer Awareness towards Environment)

Table 12: Shows Correlation between IV 2 & IV 3:

Correlation	IV 2	IV 3
IV 2	1	
IV 3	0.971497844	1

Source: Authors' Calculation

As per Correlation Analysis, the cor. Co-efficient in among IV 2 & IV 3 is 0.9714 which is positively correlated among the two variables, which may indicate the similar direction of movement. It means Affordability of Consumer to adapt EV and Awareness of the Consumers'/ Passengers' towards Concerning to the Environment will influence significantly on the Buying perception of Consumers'. However this incorporation has optimistic impression on Purchasers' Insight.

8. Conclusion

The result shows that out of two selected combinations taking three Independent variables, both the combination made an ample impact on the dependent variable that is Consumers' perception regarding buying behavior or adaption of Electric Vehicle. The reason may be stated that as the consumers are aware about the Environmental impact and also gradually moved to EV over traditional Gasoline vehicles. The result in different cases of two combinations have comparatively same impact on perception of the consumer. But with reference to the combinations, Combination I has grater impact as compare to combination II. That means Government Initiatives towards promoting of EV and Awareness of the Consumers towards impact of EV on Environmental Sustainability stimulates their perception regarding adaption of EV.

Limitations of the Study

1. This study related to Primary data survey and to some extent of Secondary data Analysis.
2. In this paper, we have used one of the statistical tools to obtain such results but it may be differed with the use of another statistical tool.

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