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## *Factors affecting Consumer's intention to Purchase Electric Vehicles*

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### I. Introduction

EVs first came into existence in the late 19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Internal combustion engines were the dominant propulsion method for cars and trucks for about 100 years, but electric power remained commonplace in other vehicle types, such as trains and smaller vehicles of all types.

Government incentives to increase adoption were first introduced in the late 2000s, including in the United States and the European Union, leading to a growing market for vehicles in the 2010s.[3][4] Increasing public interest and awareness and structural incentives, such as those being built into the green recovery from the COVID-19 pandemic, are expected to greatly increase the electric vehicle market. During the COVID-19 pandemic, lockdowns have reduced the number of greenhouse gases in gasoline or diesel vehicles.

As of July, 2022 global EV market size was $280 billion and it is expected to grow to $1 trillion by 2026

This study helps in understanding the factors affecting the consumer decisions to buy Electric Vehicle in Delhi NCR region this study primarily focuses upon the young graduates who are looking to buy a new vehicle.

EVs are vehicles that are either partially or fully powered on electric power.

Electric vehicles have low running costs as they have less moving parts for maintaining and also very environmentally friendly as they use little or no fossil fuels (petrol or diesel). While some EVs used lead acid or nickel metal hydride batteries, the standard for modern battery electric vehicles is now considered to be lithiumion batteries as they have a greater longevity and are excellent at retaining energy, with a self-discharge rate of just 5% per month.

Despite this improved efficiency, there are still challenges with these batteries as they can experience thermal runaway, which have, for example, caused fires or explosions in the Tesla model S, although efforts have been made to improve the safety of these batteries.

It can cost as little as £7.80 to fully charge an electric car from home and can even be free in public car parks.

Battery Electric Vehicles (BEV)

Compared to an internal combustion engine, battery powered electric vehicles have approximately 99% fewer moving parts that need maintenance.

BEVs can be charged at home overnight, providing enough range for average journeys. However, longer journeys or those that require a lot of hill climbs may mean that the fuel cells require charging before you reach your destination, although regenerative braking or driving downhill can help mitigate against this by charging the battery packs.

The typical charging time for an electric car can range from 30 minutes and up to more than 12 hours. This all depends on the speed of the charging station and the size of the battery.

## II. Literature Review

Numerous studies have investigated the variables that affect EV acceptance and consumers' purchase intentions. For example, **Rajesh et al. (2022)** studied factors influencing the purchase of EV vehicles in Indian auto mobile market using primary data and found out that Key determinants of electric vehicle adoption are financial incentives, charging infrastructure, social reinforcement, environmental concerns, and price. This study confirms that price is the primary determinant of electric vehicle adoption.

**Kotigari et. al. (2022)** studied factors influencing on purchase of E-Vehicles with reference to South India. Using primary data found out that It's found that there is positive correlation between the variables. Study concluded that the factors i.e., price difference, charging infrastructure, environmental concern, speed are significantly influence on the purchase of e-vehicles.

**Dhruvin et. al. (2022)** studied factors affecting electric vehicle purchase behaviour of generation Y in India. Using primary data found out that this was one of the rare types of research that investigate the association between EV purchase intention and extended theory-of-planned-behavioural factors, environmental concern, and customers' willingness to pay extra for an EV, based on our analysis of previous relevant studies. According to this research, attitudes regarding electric vehicles (EVs) have the greatest impact on EV purchase intentions, while environmental concerns have a greater impact on females' EV purchase intentions and willingness to pay more for an EV.

**Dinesh et. al. (2022)** studied multivariate analysis of the factors influencing consumer's purchase decision towards electric vehicles (EV's) in Maharashtra, India. Using primary and secondary data the study reveals that, economic factor is the most important factor that influences consumer's purchase decision towards EVs, followed by environmental, technological and infrastructural in Maharashtra, India.

**Ritu et. al. (2022)** studied Factors affecting adoption of electric vehicles in India. Using primary and secondary data. The study explores the drivers, barriers, and support mechanisms for the adoption of BEVs in India. Researchers have captured insights from manufacturers, suppliers, electric vehicle owners, potential customers, academicians & consultants, and government officials.

**Sriram et. al. (2022)** studied Factors influencing adoption of electric in India using primary data. The study identified factors such as Financial Barriers, Vehicle Performance Barriers, Lack of charging infrastructure, Environmental Conservation, Societal Influence, Social Awareness of Electric Vehicles as influencers towards electric vehicle adoption.

**Ishika et. al (2022)** conducted a study on Consumer Buying Behaviour towards Electric Vehicle using primary and secondary data. Found out that majority of the ones who are inclined towards buying an electric vehicle are concerned about the pollution caused by internal combustion engines and want to protect the environment. Petrol price hikes are also an alarming situation to them and that is a significant reason for them wanting to shift to EV's.

**Sushil and Ashirwad (2022)** conducted a study on Predicting Electric Vehicle (EV) Buyers in India: A Machine Learning Approach using primary data. The findings of the model can be used by electric vehicle marketers to enhance design, delivery, and marketing for better uptake of electric vehicles in India's personal passenger vehicle segment.

**Omkar et. al. (2022)** conducted a study on consumer perception of electric vehicles in India using primary data found out that 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.

**Girish (2022)** conducted a study on Analysis of New Normal Consumer Behaviour for Buying Cars in Indian Automotive Industries in Mumbai using primary data found out that The Study reveals that Indian Consumer's behaviour for buying cars is not the same as it was predicted before. Branding, customer connection, advertising was mostly used as common strategies in past to influence buyers' behaviour. COVID 19 has changed buyers' perceptions of the automotive industry.

**Souvik et. al. (2022)** conducted a study on Customers' Perception about electric vehicle. Using primary data, they found out that the current state of the E-V Industry is in a great position with future prospects and an enormous market share as the quality of products has evolved a lot since the beginning of the EV revolution in India.

**Tushar (2021)** conducted a study on consumer perception towards e-vehicle in Vadodara city using primary data. From the research, he found out that consumers do not prefer E-vehicle as their primary vehicle.

**Margret and Sydney (2021)** conducted a study on Consumer behaviour and the plug-in vehicle purchase: A research gap analysis using primary data. From the study they examined that PEVs are gaining traction among some consumers as a viable alternative to traditionally-fuelled LDVs. However, PEV purchasers to date tend to be early adopters living in urban, affluent neighbourhoods, primarily in States that follow California's Zero Emissions Vehicle mandate, while many mainstream mass-market consumers remain uncertain about the suitability of PEVs for their driving needs.

**Silvana et. al. (2021)** conducted a study on Electric vehicles' consumer behaviours: Mapping the field and providing a research agenda using primary data. This study examines consumer behaviour in the electric car market using the techniques of bibliometric and thematic analysis. It offers guidance for future researchers regarding consumer characteristics, theories, context, and methodologies.

**Sampling plan: -**

The sampling technique that will be used for this study will be convenience sampling. The target population for this study will be young graduates who've intent to buy EV in Delhi NCR region. The survey will be administrated using an Online platform, and data will be collected over a one-week period.

## III. Research Methodology

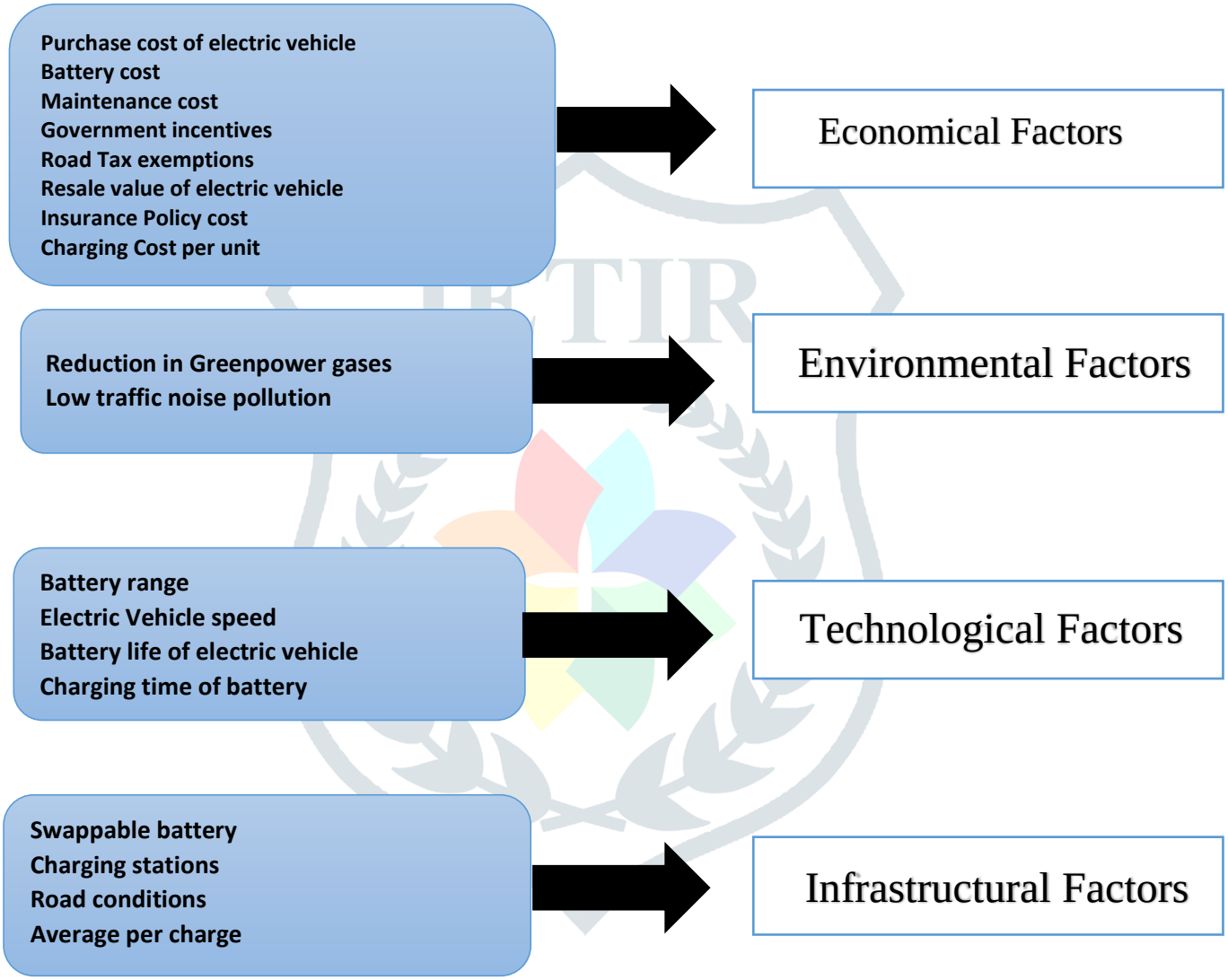
**Research Methodology: -**

This research is a mix of descriptive and experimental. The type of data used is both quantitative as well as qualitative. The data was collected using primary sources, for this a structured questionnaire was formed and distributed. The questions were mainly designed to get an insight on the factors affecting consumer's intention to purchase electric vehicles. The study was conducted in Delhi NCR. The sample aimed to be diverse in terms of age, occupation and income groups. The questionnaires were designed in a way which shed light on frequency of consumer's intention of buying electric vehicles and the factors being considered for buying. Microsoft Word, Microsoft Excel and Google Forms were used to collect and analyse the data. Once the responses were collected, they were analysed using different tools to reach a conclusion. For the quantitative part, statistical tools were used to make the analysis. The statistical tools used were mean and mode.

**Sampling plan: -**

The sampling technique that will be used for this study will be convenience sampling. The target population for this study will be young graduates who've intent to buy EV in Delhi NCR region. The survey will be administrated using an Online platform, and data will be collected over a one-week period.

## V. Proposed Conceptual Framework




**Questions:**

1. What factors encourage you to consider buy electric car?
2. What factors discourage you to consider buying electric car?
3. How likely that your next car will be electric car?
4. How important for you is someone's advice regarding choice of a car, particularly electric car?
5. Do you think e-vehicles are going to help in protecting the environment?
6. Does availability of public transport affect your decision in purchasing e- vehicles?
7. Do you think electricity rates affects in purchasing e-vehicles in a particular area?
8. Do you think there are enough charging stations?
9. Do you think electric cars can save a lot of money to the owners?
10. Do you think electric cars are expensive?
11. Do you think electric cars can replace regular cars in terms of satisfying consumer needs?

## V. Hypothesis

H01: The electricity cost per unit area does not have any impact on consumers intent to buy e-vehicle.

H01: Electricity cost per unit area have an impact on consumers decision to buy e-vehicle.

Ho2: Availability of public transport does not have impact the consumers decision to buy e-vehicle.

H12: Availability of public transport have an impact on consumers decision to buy e-vehicle.

## VI. DATA Analysis

### Regression

SUMMARY OUTPUT

| *Regression Statistics* | |
|---|---|
| Multiple R | 0.815968 |
| R Square | 0.665804 |
| Adjusted R Square | 0.573613 |
| Standard Error | 0.797285 |
| Observations | 75 |

ANOVA

| | *df* | *SS* | *MS* | *F* | *Significance F* |
|---|---|---|---|---|---|
| Regression | 16.00 | 73.45 | 4.59 | 7.22 | 0.00 |
| Residual | 58.00 | 36.87 | 0.64 | | |
| Total | 74 | 110.32 | | | |

| | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
|---|---|---|---|---|---|---|---|---|
| Intercept | -0.19 | 0.59 | -0.32 | 0.75 | -1.37 | 0.99 | -1.37 | 0.99 |
| 4 | 0.29 | 0.11 | 2.67 | 0.01 | 0.07 | 0.51 | 0.07 | 0.51 |
| 5 | 0.22 | 0.13 | 1.66 | 0.10 | -0.05 | 0.49 | -0.05 | 0.49 |
| 4 | -0.35 | 0.15 | -2.37 | 0.02 | -0.64 | -0.05 | -0.64 | -0.05 |
| 5 | -0.16 | 0.12 | -1.26 | 0.21 | -0.40 | 0.09 | -0.40 | 0.09 |
| 4 | 0.05 | 0.11 | 0.42 | 0.68 | -0.17 | 0.27 | -0.17 | 0.27 |
| 5 | -0.18 | 0.14 | -1.32 | 0.19 | -0.46 | 0.09 | -0.46 | 0.09 |
| 4 | 0.22 | 0.15 | 1.47 | 0.15 | -0.08 | 0.53 | -0.08 | 0.53 |
| 3 | 0.03 | 0.15 | 0.23 | 0.82 | -0.26 | 0.32 | -0.26 | 0.32 |
| 4 | -0.16 | 0.10 | -1.62 | 0.11 | -0.36 | 0.04 | -0.36 | 0.04 |
| 5 | 0.17 | 0.10 | 1.74 | 0.09 | -0.03 | 0.36 | -0.03 | 0.36 |
| 4 | 0.50 | 0.10 | 5.09 | 0.00 | 0.30 | 0.69 | 0.30 | 0.69 |
| 4 | -0.11 | 0.09 | -1.12 | 0.27 | -0.30 | 0.08 | -0.30 | 0.08 |
| 4 | 0.09 | 0.11 | 0.74 | 0.46 | -0.14 | 0.31 | -0.14 | 0.31 |
| 5 | -0.04 | 0.10 | -0.39 | 0.70 | -0.24 | 0.16 | -0.24 | 0.16 |
| 1 | 0.08 | 0.10 | 0.87 | 0.39 | -0.11 | 0.28 | -0.11 | 0.28 |
| 3 | 0.31 | 0.11 | 2.97 | 0.00 | 0.10 | 0.52 | 0.10 | 0.52 |

**Analysis**

**28.59%** of the variance in dependent variable is caused by the independent variables which are considered in this study

Annova table

Significance **less 0.001** compare with **0.05**

If less than **0.05** then model is significant

Model proposed in this paper is found to be significant because **0.001** is less than **0.05**

**Correlation Analysis**

Economical Factor

| | *e1* | *e2* | *e3* | *e4* | *e5* | *likely to buy electric* |
|---|---|---|---|---|---|---|
| e1 | 1 | | | | | |
| e2 | 0.143307 | 1 | | | | |
| e3 | 0.282372 | -0.00206 | 1 | | | |
| e4 | -0.39299 | 0.198438 | -0.3312 | 1 | | |
| e5 | 0.074849 | 0.148508 | 0.182441 | -0.05377 | 1 | |
| likely to buy electric | 0.36935 | 0.142182 | 0.591914 | -0.27848 | 0.174215 | 1 |

| | *economical* | *likely to buy electric* |
|---|---|---|
| economical | 1 | |
| likely to buy electric | 0.446459 | 1 |

**ECONOMICAL FACTORS:**

The correlation coefficient between economic factors and likely to buy electric car is **0.446** so these 2 variables are weakly correlated

Correlation is found to be significant because its value is **less than 0.05**

Infrastructure

| | *i1* | *i2* | *i3* | *likely to buy electric* |
|---|---|---|---|---|
| i1 | 1 | | | |
| i2 | 0.281923 | 1 | | |
| i3 | 0.205255 | 0.310818 | 1 | |
| likely to buy electric | 0.367961 | 0.374481 | 0.277255 | 1 |

| | *infrastructure* | *likely to buy electric* |
|---|---|---|
| infrastructure | 1 | |
| likely to buy electric | 0.474786 | 1 |

**INFRASTRUCTUAL FACTORS:**

The correlation coefficient between infrastructural factors and likely to buy electric car is **0.474** so these 2 variables are weakly correlated

Correlation is found to be significant because its value is **less than 0.05**

Environmental

| | *e1* | *e2* | *likely to buy electric* |
|---|---|---|---|
| e1 | 1 | | |
| e2 | 0.562957 | 1 | |
| likely to buy electric | 0.268016 | 0.15683 | 1 |

| | *environmental* | *likely to buy electric* |
|---|---|---|
| environmental | 1 | |
| likely to buy electric | 0.242338 | 1 |

**ENVIORNMENTAL FACTORS:**

The correlation coefficient between environmental factors and likely to buy electric car is **0.242** so these 2 variables are weakly correlated

Correlation is found to be significant because its value is **less than 0.05**

Technological

| | *t1* | *t2* | *likely to buy electric* |
|---|---|---|---|
| t1 | 1 | | |
| t2 | 0.694615 | 1 | |
| likely to buy electric | 0.057821 | 0.083242 | 1 |

| | *technological* | *likely to buy electric* |
|---|---|---|
| technological | 1 | |

| | | |
|---|---|---|
| likely to buy electric | 0.076905 | 1 |

**TECHNOLOGICAL FACTORS:**

The correlation coefficient between technological factors and likely to buy electric car is **0.076** so these 2 variables are weakly correlated

Correlation is found to be significant because its value is **less than 0.05**

Psychological

| | *p1* | *p2* | *p3* | *p4* | *p5* | *likely to buy electric* |
|---|---|---|---|---|---|---|
| p1 | 1 | | | | | |
| p2 | 0.218392 | 1 | | | | |
| p3 | 0.264519 | 0.576938 | 1 | | | |
| p4 | 0.184424 | -0.04876 | -0.05927 | 1 | | |
| p5 | 0.106846 | -0.03776 | -0.13081 | 0.514444 | 1 | |
| likely to buy electric | 0.213614 | 0.075036 | -0.06333 | 0.664001 | 0.515124 | 1 |

| | *psychological* | *likely to buy electric* |
|---|---|---|
| psychological | 1 | |
| likely to buy electric | 0.511452 | 1 |

**PHYSCOLOGICAL FACTORS:**

The correlation coefficient between physcological factors and likely to buy electric car is **0.511** so these 2 variables are weakly correlated

Correlation is found to be significant because its value is **less than 0.05**

**VII. Conclusion**

This study aimed to explore the factors affecting consumers' intentions to purchase EVs, focusing specifically on users' perception and attitude using survey data. Users' perception and attitudinal attributes considered in this study included Charging per unit cost which comes under economical factor and the average per charge which is infrastructural factor. This study revolves around these factors, other factors have been already covered in previous research papers. Public charging stations are usually more expensive than charging at home, and the cost can vary depending on the location and the charging network. Some public charging stations are free, while others may charge a flat fee or a per-kilowatt-hour rate. The statistical models successfully produced interpretable outcomes, revealing the influencing factors; thus, they can be used to help analysts reasonably predict a consumer's intention to purchase an EV. The correlation coefficient between economic factors and likely to buy electric car is **0.446** so these 2 variables are weakly correlated. A correlation coefficient of 0.242 indicates a weak positive correlation between environmental factors and the likelihood of buying an electric car. This means that as environmental factors increase, the likelihood of buying an electric car also increases, but the relationship between these variables is not particularly strong or predictable.

The statement that the correlation is significant because its value is less than 0.05 is not accurate. The significance of a correlation coefficient depends on the sample size and the level of significance (often denoted as alpha, which is typically set at 0.05 or 0.01). A correlation coefficient may be statistically significant (i.e., unlikely to have occurred by chance) even if its absolute value is small, depending on the sample size. A correlation coefficient of 0.474 indicates a moderate positive correlation between infrastructural factors and the likelihood of buying an electric car. This means that as infrastructural factors increase, the likelihood of buying an electric car also tends to increase, and the relationship between these variables is stronger than in the previous examples.

The correlation coefficient between infrastructural factors and likely to buy electric car is **0.474** so these 2 variables are weakly correlated. Correlation is found to be significant because its value is **less than 0.05**

The statement that the correlation is significant because its value is less than 0.05 is also not accurate. The significance of a correlation coefficient depends on the sample size and the level of significance (often denoted as alpha, which is typically set at 0.05 or 0.01). A correlation coefficient may be statistically significant (i.e., unlikely to have occurred by chance) even if its absolute value is small, depending on the sample size.

Our analysis found that charging per charge had a significant impact on EV usage, with longer charging times resulting in a decrease in the number of trips taken by EV owners. This finding highlights the importance of efficient charging infrastructure and battery technology to ensure that EVs are convenient and practical for everyday use.

In addition, we found that average cost per charge had a significant impact on EV usage, with higher costs resulting in a decrease in the number of trips taken by EV owners. This suggests that policies and incentives that make EV ownership and charging more affordable may help to promote their adoption and usage.

Overall, our research highlights the importance of both charging per charge and average cost per charge in shaping EV usage patterns. Future research could further explore the impact of other factors, such as range anxiety and access to charging infrastructure, on EV adoption and usage.

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