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A Study on Dominance of Electrical Vehicles Over Internal Combustion Engines (ICE) Vehicles in Hyderabad

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Abstract— *This study is focused on understanding the current growth and perception of Electric Vehicles (EVs) compared to Internal Combustion Engine (ICE) vehicles in Hyderabad. The study is divided into four key areas. First, it explores how customers in Hyderabad feel about using EVs – their preferences, concerns, and what influences their choices. Second, it identifies the major challenges EVs are facing in the city, such as issues related to technology, cost, and charging infrastructure. Third, it examines the environmental impact of EVs compared to traditional fuel-based vehicles, especially how zero carbon emissions from EVs are affecting customer decisions. Lastly, it studies the role of government support, including policies, subsidies, and incentives that encourage the shift towards EVs. However, the study has some limitations. It is restricted to Hyderabad, so the findings might not apply to other regions. Also, due to time limits and fewer respondents, the research could not cover long-term trends or represent the views of all sections of society. Still, it gives a meaningful snapshot of the current EV scenario and what steps can be taken to make EVs a better and more attractive choice for consumers.*

Keywords— ***Electric Vehicles (EVs), Internal Combustion Engine (ICE) Vehicles, Consumer Perception, EV Adoption, Charging Infrastructure, Environmental Impact, Zero Carbon Emissions, Government Policies, Subsidies and Incentives, Sustainable Transportation.***

I. INTRODUCTION

Electric Vehicles (EVs) are emerging as a sustainable alternative to Internal Combustion Engine (ICE) vehicles, driven by rising environmental concerns, fuel price volatility, and government support in India. With benefits such as zero emissions, low maintenance, and government subsidies, EVs are increasingly preferred by urban consumers. Hyderabad, being a growing metro city, reflects this transition. The Indian government's policies like the FAME scheme and reduced taxes on EVs, have further accelerated adoption. While ICE vehicles have dominated for over a century, the shift towards clean mobility marks a significant transformation in the Indian automobile landscape.

OBJECTIVE OF THE STUDY

1. To know the customer perception towards EVs.
2. To know the polices of government schemes to help the EVs' growth.
3. Analysing the impact of EVs on the environment over ICE vehicles.
4. Identifying the challenges EVs faced over ICE vehicles.

NEED FOR THE STUDY.

This study identifies current customers' perceptions of EVs over ICE vehicles in Hyderabad, the challenges experienced by EVs, and the effect of zero carbon emissions based on customer decisions. It also

explores how government policies and incentives are enabling the switch from fuel-based vehicles to electric ones.

The study provides a clear picture of how EVs are expanding and what factors are impacting the rise of EVs by using customers' data and providing future insights/recommendations to improve EVs in the future to increase the adoption rate of EVs.

SCOPE OF THE STUDY

1. To know the customer perception of EVs against ICE vehicles.

2. To address the challenges of EVs from technology, finance, and infrastructure.

3. Consumer perception of EVs by considering the Environmental factors.

4. To improve our understanding of the role of government policy (subsidies, regulations, etc.) in promoting EVs.

LIMITATIONS OF THE STUDY

1. The study is confined to the Hyderabad region, and the results may not apply to other cities or regions with different infrastructure, demographics, and government policies

2. The project was done in a short period. Because of this, we couldn't study long-term changes or trends

3. The study includes only a limited number of people, so it may not show the full picture of everyone's opinion in the city.

4. There wasn't much past data available for EV use in Hyderabad, so the study mainly depends on what people think right now.

II. REVIEW OF LITERATURE

- **McKinsey & Company (2025):**EVs are getting more cost-effective compared to ICE vehicles. Exploration by McKinsey & Company (2025) suggests that the total cost of ownership (TCO) of EVs is projected to be lower than ICE vehicles by 2027 due to lower energy and conservation costs. A study by Cox et al.(2022) found that 70% of consumers prefer EVs due to lower operating charges and better driving gests.
- **Sustainable Decarbonisation of Road Transport (2024):** Electric vehicles (EVs) offer a practical solution to reduce CO_2 emissions from road transport. Supportive government policies, incentives, and consumer interest drive global EV adoption. China leads in EV market size and technology, while Norway has the highest EV adoption rate. Key factors include infrastructure, innovation, and regulations.
- **International Energy Agency (2023):**The Global EV Outlook by IEA reviews global electric vehicle trends, including growth, charging infrastructure, battery use, emissions, and policies. It highlights market performance, investments, and trade. The report supports climate goals and offers interactive tools for exploring EV data and policies to guide governments and stakeholders in future planning.
- **Fuels Institute (2022):** Ricardo conducted a life cycle and cost analysis comparing electric (BEV), hybrid (HEV), and internal combustion engine (ICE) vehicles. The study found that BEVs emit fewer greenhouse gases after 19,000 miles and have lower long-term ownership costs. Key factors include battery life, electricity sources, policies, and consumer behaviour.
- **International Energy Agency (2021):**A key driver behind EV adoption is their lower carbon footprint. Research by Arias and Bell (2022) highlights that EVs produce significantly less CO_2 emissions over their lifecycle compared to gasoline or diesel-powered vehicles. Governments worldwide are implementing stricter emission regulations and banning ICE vehicles in major cities (IEA, 2023). For instance, the EU and California have announced plans to phase out new ICE vehicle sales by 2035 (Schmidt, 2022).
- **Praveen Kumar, Kalyan (2013):** Possible Demand for EVs, Charging Stations, and the Difficulties Confronting the Indian Market: written by Praveen Kumar and Kalyan Hello, Run. As an alternative to attempting a massive overhaul, India could finance localised reinforcements on a smaller scale to deal with load difficulties. It is advisable to promote charging at home.
- **ARUN.R. B (2011):** This study explores factors influencing consumer decisions when buying

cars, emphasising the importance of understanding customer preferences. It also highlights India's reliance on imported crude oil for diesel, which impacts pricing, technology adoption, and economic stability. Manufacturers must create fuel-efficient vehicles to meet consumer needs and support sustainability.

Research Gap

1. Most studies on electric vehicles (EVs) focus on major cities, but there is limited research on consumer perception and challenges specific to Hyderabad.

2. There is also a lack of data on how factors like age, income, and government subsidies influence EV adoption in this region.

3. This study aims to fill these gaps by understanding local opinions, environmental concerns, and the role of government support in promoting EVs in Hyderabad.

RESEARCH METHODOLOGY

This study was conducted to know the customer perception of EVs over ICE vehicles, and also how government policies and schemes help the growth of EVs, and the challenges faced by EVs over ICE vehicles.

The data was collected in the form survey. The questions were prepared related to my topic, and I have shared those questions with different customers, and I have collected different opinions from them.

RESEARCH DESIGN:

My research design is descriptive is used to describe the current situation and understanding of consumer behaviour and opinions regarding the ICE and EV vehicles.

TOOLS USED:

MS Excel, Google Forms, charts, and pie charts.

DATA CLASSIFICATION: Population: 150 Sample: 105

III. DATA COLLECTION METHODS

Primary Data: This study is based on primary data collected through a structured questionnaire using Google Forms. The survey was shared with residents of Hyderabad to understand their perception of EVs compared to ICE vehicles.

Secondary Data: The data is gathered from the published journals, research papers, and company websites.

STATISTICAL TOOL USED: Chi-square

IV. RESULTS AND FINDINGS

1. **Do you think EV vehicles will dominate ICE vehicles in the future?**

Dominate In the Future	No of Respondents	Percentage
Yes	84	80%
No	21	20%
Total	105	100%

Interpretation

Most of the respondents, 84%, responded that in the near future, EVs will completely dominate ICE vehicles. And a very small percentage of respondents, 20%, responded that EVs will not dominate the ICE vehicle in coming future. This indicates that EVs will dominate the ICE vehicles in coming future in Hyderabad.

2. **Would you consider an EV for your next vehicle purchase?**

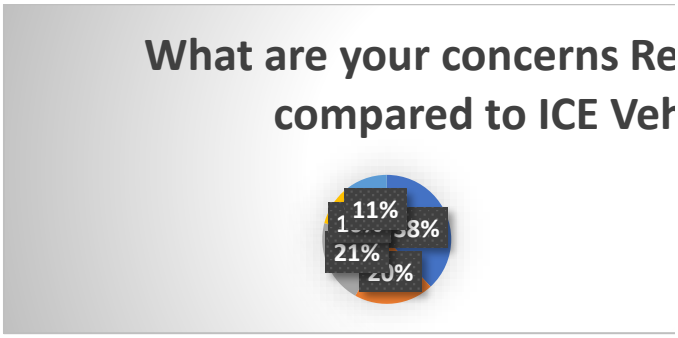
	No of Respondents	Percentage
Yes	80	76%
No	25	24%
Total	105	100%

Interpretation:

Most of the respondents, 76%, are considering an EV for their next vehicle purchase. This indicates that EVs are dominating the ICE vehicles, and most customers are showing interest in purchasing an EV for their next vehicle purchase in Hyderabad. And a small percentage of 24% of respondents are not considering an EV for their next vehicle purchase.

3. **What are your concerns regarding EVs compared to ICE vehicles?**

Concerns	No of Respondents	Percentage
Limited Driving Range	40	38%
Insufficient Charging Infrastructure	21	20%
Long charging time	22	21%
High Purchasing price	10	10%
Battery life span	12	11%
Total	105	100%

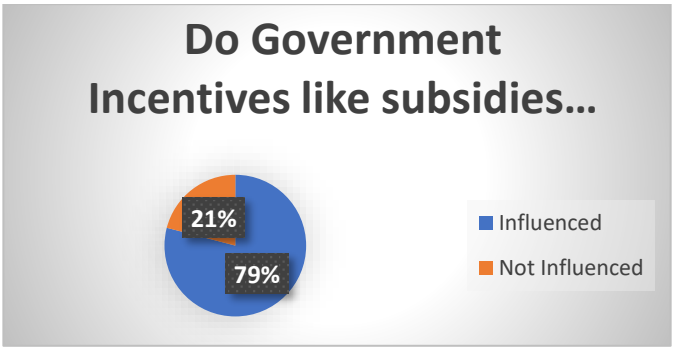


Interpretation:

The main concern among respondents regarding EVS is the limited driving range, 38%, followed by long charging time, 21%, and insufficient charging infrastructure20%. And a small percentage of concerned about battery lifespan, 11%, and high purchasing price, 10%. These concerns need to be addressed to improve EV adoption compared to ICE vehicles in Hyderabad

4. **Do government incentives like subsidies influence your vehicle purchase decision?**

	No of Respondents	Percentage
Influenced	83	79%
Not Influenced	22	21%
Total	105	100%



Interpretation:

Most of the respondents, 79%, were influenced by the government subsidies for purchasing their EV vehicle. And 21% were not influenced by government subsidies. This indicates that the government subsidies encourage customers to purchase the EVS over ICE vehicles.

5. **Do you think EVs are better for protecting the Environment over ICE vehicles?**

	No of Respondents	Percentage
Yes	92	88%
No	13	12%
Total	105	100%

Interpretation:

Most of the respondents, 88%, believe that EVS are better at protecting the environment than ICE

vehicles. 12% believe that EVS does not protect the environment compared to ICE vehicles. This shows strong public awareness and support for the environmental benefits of EVs. Especially cities like Hyderabad have high air pollution, so by using EVS, we can decrease the air pollution and protect the environment in Hyderabad.

STATISTICAL TOOLS FOR ANALYSIS

H0: EVs are not better at protecting the environment compared to ICE vehicles.

H1: EVs are better at protecting the environment compared to ICE vehicles.

Chi-square calculation

	Observed value	Expected value	x^2
YES	92	52.5	29.71905
NO	13	52.5	29.71905
TOTAL	105	105	59.4381
x^2 table value	x^2 calculated value		
3.841	59.4381		
H0 rejected	H1 accepted		

As the table value is less than the calculated value. We reject H0 (null) and accept H1 (alternative)

Note: -

x^2 = chi square

O = Observed value

E = Expected value

Formula: - "=(O-E) ^2/E "

Degree of freedom: -1

Significance: - 0.05

Since the p-value is less than 0.05, H0 is rejected and H1 is accepted. So, EVs are better at protecting the Environment compared to ICE vehicles.

V. DISCUSSION

1. 80% of respondents believe that EVS will dominate ICE vehicles completely in the future, which shows a positive public opinion toward the adoption of EVS in the future.
2. 76% of respondents are willing to buy an EV for their next vehicle purchase, showing a strong intent to switch from ICE to EV.
3. The top concern among the respondents was limited driving range, 38%, followed by long charging time, 21%, and lack of charging, 20%. These concerns need to be resolved to increase the adoption of EVS over ICE.
4. 79% of respondents said government subsidies influenced their decision to consider EVs, indicating that policy incentives are crucial in boosting the adoption of EVs.
5. 88% of respondents agreed that EVs are more environmentally friendly than ICE vehicles, showing a clear public alignment with green transportation solutions to protect the environment.

VI. CONCLUSION

From the study, it is clear that electric vehicles (EVs) are gaining popularity in Hyderabad, especially among the younger generation. Most people are aware that EVs are better for the environment and are willing to adopt them in the future. However, some important challenges—like high prices, lack of

charging stations, and limited driving range—are slowing down their adoption.

Government policies and subsidies are playing a key role in encouraging people to choose EVs. Interestingly, many people are willing to switch to EVs even without these incentives, showing a strong positive shift in consumer thinking.

By taking the right steps, like better infrastructure, more affordable EVs, and stronger public awareness, Hyderabad can lead the way in the transition from ICE vehicles to EVs. This leads to pollution-free transportation in Hyderabad, which helps to protect the environment.

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