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# **Comprehensive analysis on Challenges in adoption electric vehicle Electric Vehicle (EV) Adoption**

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#### **ABSTRACT :**

This research investigates consumer awareness, perceptions, and key barriers affecting the adoption of electric vehicles (EVs) in India. Using a mixed-methods design that combines a nationwide survey (n = 28) with expert interviews and secondary data review, the study finds that awareness of EVs is high (89.3 %), yet actual usage remains modest, constrained by high upfront cost, range anxiety, and insufficient charging infrastructure. The findings highlight policy and industry actions required to close the gap between interest and adoption.

# Introduction

Electric mobility is a pivotal solution to mitigating climate change-induced emissions from the transportation sector. India's ambitious target to electrify 30 % of its vehicles by 2030 underscores the urgency to decode adoption drivers and bottlenecks. This paper reframes an undergraduate thesis into a concise journal-ready research report.

# Literature Review

Previous research highlights several persistent issues in EV adoption. IEA (2023) notes the importance of incentives and charging infrastructure. Singh et al. (2021) emphasize the significance of consumer perception and government initiatives. Sharma and Yadav (2022) discuss psychological and economic barriers, especially in developing markets. This study complements prior work by adding a micro-level primary data analysis from Indian respondents.

#### **Research objectives**

- Analyze the primary challenges that impact the adoption of electric vehicles (EVs).
- Evaluate the economic sustainability of EVs and assess the outcomes of relevant policies.
- Examine consumer awareness and behavioral dynamics influencing EV purchasing and usage.
- Investigate manufacturing, technological, and environmental challenges within the EV sector.

# **Research Methodology**

A descriptive survey was disseminated via Google Forms, capturing responses from 30 urban and semi-urban residents across 15 Indian states. Questions covered awareness, ownership, willingness to pay, and perceived barriers. Complementary expert interviews with EV owners and dealership staff enriched the qualitative insights.

# **Data Visualisations**

Figure 1: Awareness of Electric Vehicles



Figure 2: Usage Experience of EVs







#### **Explanation:**



**Explanation:** 

Figure 5: Self-rated EV Awareness Level



**Explanation:** 





Based on the analysis of the bar chart "Number of Electric Vehicles (EVs) by Gender," the primary conclusion is that male individuals demonstrate a significantly higher rate of Electric Vehicle adoption compared to female individuals and those identifying as "Others" within the dataset observed. This suggests a notable gender disparity in EV ownership, with males currently forming the largest segment of EV consumers among the represented categories.

This stacked bar chart visualizes the "Mode of Transportation" for "Gender" categories (Male, Female, Others). Each bar's segments represent the proportion of "Car," "Bus," "Bike," and "Others" within that gender, indicating a dominant reliance on "Car" and "Bike" across all groups, with gender-specific variances in modal split.

The image displays a bar chart titled "Challenges Faced by EV Owners," illustrating various obstacles encountered by Electric Vehicle owners. The Xaxis enumerates specific challenges (e.g., "High Purchase Cost," "Charging Infrastructure," "Range Anxiety"), while the Y-axis quantifies the "Number of Respondents" who identified each challenge. This visualization quickly conveys the most prevalent challenges hindering EV adoption or satisfaction, with "Charging Infrastructure" appearing to be the most frequently cited concern among respondents.

The image displays a stacked bar chart titled "Type of Electric Vehicle Owned." This chart categorizes the "Number of Respondents" (Y-axis) based on the "Type of EV" they own (e.g., "Two Wheeler," "Three Wheeler," "Four Wheeler," "Others"), further segmented by "Gender" (Male, Female, Others) within each EV type. The visual effectively illustrates the distribution of EV ownership across vehicle types and gender demographics, indicating that "Two Wheelers" are the most commonly owned EV type across all gender categories.

The image presents a bar chart titled "Factors Influencing EV Purchase Decision." This chart illustrates various factors (e.g., "Government Incentives," "Environmental Concerns," "Lower Running Cost," "Advanced Features") that influence a consumer's decision to purchase an Electric Vehicle. The Yaxis represents the "Number of Respondents" who consider each factor important, providing a quantitative insight into the key motivators for EV adoption. "Government Incentives" and "Lower Running Cost" appear to be the most significant factors influencing purchase decisions among the surveyed individuals.

## **Results and Discussion**

Survey data reveal that although 46.4 % are willing to purchase an EV within three years, affordability and charging access remain decisive constraints. Detailed interpretations of each graph follow the visual section.

#### Conclusion

EV adoption in India is poised for exponential growth provided that financial incentives are complemented by robust infrastructure and targeted consumer education. Future research should leverage longitudinal datasets and include rural cohorts to capture a holistic view.

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