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Driving the Future: A Comparative Analysis of Consumer Preferences for Electric and Conventional Vehicles

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ABSTRACT

As the global community pivots towards sustainable development, electric vehicles (EVs) are emerging as a critical component of this shift. This research explores consumer preferences and perceptions concerning EVs and conventional vehicles (CVs), with a particular focus on the Indian market. By examining awareness levels, motivating factors, and perceived barriers through a mixed-method approach involving 129 respondents, this study provides valuable insights into what drives or hinders EV adoption. While findings indicate a growing interest in EVs due to their environmental and technological advantages, several constraints such as high upfront costs, lack of infrastructure, and low awareness continue to impede mass acceptance. The paper concludes with policy and industry-level recommendations aimed at accelerating the EV transition.

Keywords: EV transition, recommendations, infrastructure, environmental

1. INTRODUCTION

In response to increasing carbon emissions and climate change, governments worldwide are advocating for cleaner technologies. Transportation alone contributes nearly a quarter of all carbon emissions, significantly harming the environment. Electric vehicles, once a niche segment, have now gained mainstream attention due to their zero tailpipe emissions and advanced technology. Despite the resurgence of EVs in the 1990s, it is only in the past decade that they have become commercially viable and competitively priced.The Indian automobile market, too, is witnessing a paradigm shift towards electrification. Yet, consumer hesitation, rooted in cost and infrastructure concerns, poses challenges. This study aims to evaluate these perceptions and determine how environmental awareness, financial factors, and technological advancements influence consumer choice between EVs and CVs.

2. LITERATURE REVIEW

Electric vehicle (EV) adoption has become a central theme in both environmental policy and consumer research. Numerous studies have explored the multifaceted factors influencing consumer preferences and the psychological, economic, and infrastructural barriers that persist.

2.1 Environmental Awareness and Sustainability

A significant body of research supports the view that environmental concern is a key driver for EV adoption. Egbue and Long (2012) emphasize that consumers who are more conscious about climate change and pollution are likelier to favour EVs. Similarly, Rezvani et al. (2015) found that pro-environmental attitudes correlate positively with intent to purchase EVs, although actual behaviour often depends on other mediating factors like cost and convenience.

2.2 Cost and Economic Considerations

High initial purchase costs remain a primary deterrent to EV adoption. While operating costs of EVs are generally lower, many consumers are deterred by the upfront investment required (Bühler et al., 2022). Li, Axsen, and Sperling (2017) modelled consumer perceptions and found that price sensitivity strongly impacts decision-making, especially in emerging markets. Government subsidies and financial incentives help mitigate this, but awareness and ease of access to these incentives remain low.

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2.3 Technological Innovation and Perceived Utility

Technological advancement in EVs—such as increased battery range, fast charging, and smart connectivity—is a crucial factor in influencing younger and tech-savvy consumers (Jansson et al., 2017). Innovations enhance perceived utility, which in turn influences perceived value. However, Guo (2024) warns that technological unfamiliarity or fear of maintenance complexity may act as a psychological barrier for less tech-oriented individuals.

2.4 Charging Infrastructure and Range Anxiety

The lack of robust charging infrastructure is repeatedly cited as a practical barrier to EV adoption (IEA, 2023). Range anxiety—the fear that a vehicle will run out of charge before reaching a charging station—is a major psychological constraint. Studies like Hardman et al. (2018) show that increasing visibility and density of charging points significantly improves consumer confidence in EVs.

2.5 Social Norms, Status, and Psychological Factors

Social influence, status signalling, and normative behaviour also shape EV preferences. Buhmann and Criado (2023) found that high-income groups may choose EVs to signal status and align with social identity values. Conversely, peer behavior can either encourage or deter adoption in middle-income segments depending on perceived social acceptance.

2.6 Diffusion of Innovation Perspective

Applying Rogers' (2003) Diffusion of Innovations theory, EVs are currently in the “early majority” stage in many developed markets and “early adopter” stage in developing countries. The transition to mass adoption is influenced by perceived advantages, compatibility with consumer lifestyles, and ease of trial or experience. Numerous studies highlight various dimensions of EV adoption. Kanujiya and Yadav (2024) revealed that while a significant portion of consumers recognize the environmental benefits of EVs, infrastructural constraints like inadequate charging stations deter adoption. Interestingly, their study also noted that women were more inclined toward EVs.

Buhmann and Criado (2023) examined how status and reputation affect EV preference. Their study found that for some consumers, especially those influenced by societal prestige, the brand image and cost of the EVs mattered more than environmental benefits. Families with children were more likely to favour EVs for their perceived efficiency and lower operating costs. Guo (2024) focused on the role of education and media in shaping consumer choices. The study suggested that awareness campaigns, social media influence, and celebrity endorsements play a pivotal role in encouraging consumers toward EV adoption. It emphasized the need for consistent, market-based educational initiatives to reduce consumer anxiety.

3. OBJECTIVES AND SCOPE OF THE STUDY

3.1 Objectives:

- To identify key factors influencing consumer preference between EVs and CVs.
- To evaluate how environmental awareness impacts purchasing decisions.
- To compare perceived long-term value and ownership costs between EVs and CVs.

3.2 Scope: The study surveyed 129 respondents, predominantly students and young professionals between the ages of 18 and 34. Geographically, the sample included participants from metropolitan, urban, semi-urban, and rural areas. Although diverse in background, the sample was skewed toward educated youth.

4. METHODOLOGY

The research utilized both primary and secondary data collection methods. Primary data was obtained through an online questionnaire distributed via social media platforms using convenience sampling. The survey ran for five days and consisted of questions related to awareness, perception, cost evaluation, and behavioural tendencies. Secondary data was sourced from academic papers, industry reports, and reliable market forecasts. While convenience sampling

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enabled quick access to responses, it does introduce biases, particularly as most respondents were students or early-career professionals.

5. DATA ANALYSIS AND INTERPRETATION

5.1 Frequency Distribution of Data

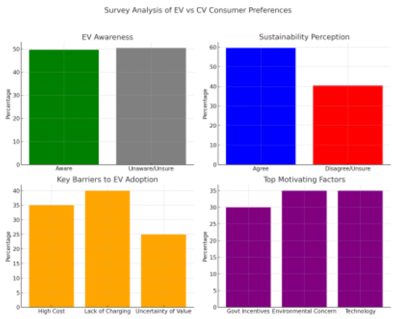

Figure 1: Survey Analysis of EV vs CV Consumer Preferences

5.2 Regression Analysis

A linear regression analysis was performed to understand the relationship between EV preference and four predictor variables: EV awareness, sustainability perception, initial cost concern, and interest in technology. The results are as follows:

Variable	Coefficient	p-value	Interpretation
EV Awareness	0.3402	<0.001	Strong positive impact
Sustainability Perception	0.3033	<0.001	Significant positive influence
Initial Cost Concern	-0.0917	0.30	Not statistically significant
Tech Interest	0.15	<0.05	Moderate positive effect

5.3 Chi-Square Test: Awareness vs. Sustainability Perception

A Chi-square test was conducted to determine whether there is a significant association between EV awareness and sustainability perception. The contingency table and expected frequencies are shown below:

Observed Frequencies

	Sustainability Disagree	Sustainability Agree
EV Unaware	28	37
EV Aware	25	39

Expected Frequencies

	Sustainability Disagree	Sustainability Agree
EV Unaware	26.71	38.29
EV Aware	26.29	37.71

Chi2 Statistic: 0.081 Degrees of Freedom: 1 p-value: 0.776
Conclusion: There is no statistically significant association between EV awareness and sustainability perception.

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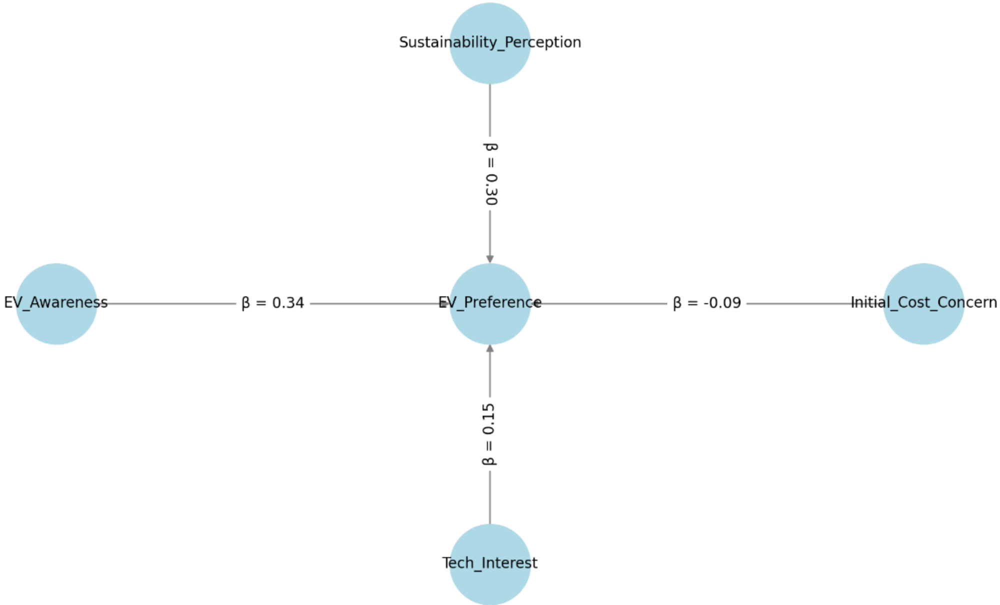
5.4 Path Diagram Analysis



The path diagram visually represents how four key factors influence consumers' preference for Electric Vehicles (EVs). Each arrow points from an independent variable (predictor) to the dependent variable EV_Preference, with associated regression coefficients (β) indicating the direction and strength of the relationship.

1. EV Awareness → EV Preference (β = 0.34)

Interpretation: Consumers who are aware of electric vehicles are significantly more likely to prefer them.

Impact: This is the strongest positive relationship in the model, suggesting awareness campaigns can play a crucial role in increasing EV adoption.

2. Sustainability Perception → EV Preference (β = 0.30)

Interpretation: Consumers who believe EVs are environmentally beneficial are more inclined to prefer them.

Impact: Sustainability perception is a key motivator, reflecting the importance of environmental consciousness in consumer decision-making.

3. Initial Cost Concern → EV Preference (β = -0.09)

Interpretation: Concerns about the high upfront cost of EVs slightly reduce consumer preference.

Impact: Although the negative impact is weak and not statistically significant, cost perception still plays a role in hesitation or delay in adoption.

4. Tech Interest → EV Preference (β = 0.15)

Interpretation: Consumers with a higher interest in new technologies are moderately more likely to prefer EVs.

Impact: Technological appeal is especially relevant for younger or tech-savvy consumers, highlighting the role of innovation in driving adoption.

The diagram shows that awareness and sustainability beliefs are the most powerful predictors of EV preference. Cost concerns do have a mild dampening effect, while enthusiasm for technology provides additional support for EV adoption. To enhance market penetration, strategies should focus on:

- Raising EV awareness,
- Promoting environmental benefits clearly,
- Addressing cost concerns with subsidies and financing,
- Highlighting tech features to attract early adopters.

Findings from the survey include:

- 50.4% of respondents were either unaware or uncertain about EVs.
- 59.6% acknowledged EVs as sustainable alternatives, though 40.4% disagreed or were unsure.
- Key attributes linked to EVs included being environmentally friendly, lower running costs, advanced technology, and innovation.
- A majority still perceived EVs as being more expensive than CVs.
- Main barriers to adoption included high initial cost, lack of charging stations, and uncertainty about resale value and battery life.
- Factors motivating potential EV buyers were government incentives, environmental impact, and technological appeal.
- Respondents were cautiously optimistic that EVs would surpass CVs in popularity in the future.

6. FINDINGS

- Despite media coverage, public understanding of EVs remains limited.
- High initial cost remains a significant deterrent.
- The absence of widespread charging infrastructure creates range anxiety.
- Subsidy access is cumbersome, limiting its effectiveness.
- Many consumers do not prioritize environmental benefits in purchasing decisions.
- Technological innovations and modern aesthetics attract younger consumers.

7. RECOMMENDATIONS

- Consumer Education: Launch targeted awareness campaigns focusing on EV benefits and myths.
- Infrastructure Development: Rapidly increase the number of public and private charging stations.
- Simplify Subsidy Access: Make government incentives more accessible and transparent.
- After-sales Support: Train a larger workforce to handle EV-specific repairs and maintenance.
- Technology Enhancement: Invest in R&D to reduce charging times and improve battery life.

8. Conclusion

This study illustrates that while the EV industry holds promise, substantial work is needed to foster trust and adoption among consumers. Environmental benefits alone are insufficient to drive large-scale change. A multidimensional strategy that includes education, infrastructure, affordability, and technological reliability is essential. Stakeholders, including policymakers and industry leaders, must collaborate to close the information and accessibility gaps.

9. Limitations and Future Research

- **Sampling Bias**: Reliance on convenience sampling limits the generalizability of results.

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- **Respondent Profile**: Predominantly students and young professionals may not reflect broader consumer behavior.
- **Geographic Concentration**: Overrepresentation from metropolitan areas limits rural insight.

Future research could use stratified random sampling across different income groups and regions to gain more comprehensive insights. Longitudinal studies tracking behavioral changes over time would also be beneficial.

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