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Comparative Study On E-Vehicles And Fuel Vehicles With Special Reference To Coimbatore City

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Abstract:

The Indian automotive sector is witnessing a transformative shift towards electric vehicles (EVs), driven by concerns over sustainability, fuel costs, and energy efficiency. However, challenges such as range anxiety, high initial costs, and insufficient charging infrastructure continue to hinder the widespread adoption of EVs. This study explores consumer preferences for electric and fuel-powered vehicles in Coimbatore, focusing on factors like cost efficiency, environmental impact, and government policies. Using data collected from 263 respondents, the research examines the impact of income, age, and gender on EV adoption attitudes. The findings indicate no significant association between income or age and preferences for EVs. Gender, however, shows a notable difference in the perception of government investment in EV infrastructure, with males expressing stronger support. Despite these variations, the overall consumer response to EV adoption is relatively consistent. The study suggests that EV adoption initiatives should target broad demographics and prioritize the expansion of charging infrastructure. Additionally, both male and female consumers should be engaged in discussions about EV infrastructure development to foster a more sustainable and inclusive transportation ecosystem. This research offers valuable insights for policymakers, manufacturers, and marketers aiming to accelerate EV adoption in Coimbatore and similar urban settings.

Keywords:

Indian Automotive Sector, Electric Vehicles (EVs), Fuel-powered Vehicles, Consumer Preferences, Cost Efficiency, Environmental Impact, Government Policies, EV Adoption, Charging Infrastructure, Range Anxiety, Initial Costs, Income and EV Adoption, Age and EV Adoption, Gender and EV Infrastructure, Sustainability

INTRODUCTION

The Indian automotive industry is undergoing a transformative shift as concerns over environmental sustainability, fuel costs, and energy efficiency drive the adoption of electric vehicles (EVs). While EVs promise lower emissions and reduced operating costs, their widespread acceptance remains hindered by factors such as range anxiety, high initial costs, and limited charging infrastructure. In cities like Coimbatore, where fuel-powered vehicles continue to dominate due to their affordability and established support networks, consumer perceptions play a crucial role in shaping the future of mobility. This article explores the evolving automotive landscape in India, analyzing the factors influencing consumer preferences for fuel and electric vehicles, government initiatives promoting EV adoption, and the challenges faced in transitioning toward sustainable transportation. By examining Coimbatore as a case study, we aim to provide

insights that can guide policymakers, manufacturers, and marketers in balancing the push for electrification while addressing consumer concerns and preferences.

Objective of the study

- To compare preferences for electric versus fuel cars based on key factors.
- To study the influence of government policies on consumer choices.

LITERATURE SURVEY

Author: Sun, M., and S. S. Zhang (2021)

Title: *Comparing EV Charging and Fueling Station Networks: A Global Review*
This paper compares the global development of EV charging networks with the existing fueling infrastructure for conventional vehicles. The authors analyze the coverage, efficiency, and availability of charging stations, highlighting the challenges faced by EV owners in regions with underdeveloped charging infrastructure. The study stresses the need for significant investment in EV charging networks to ensure the widespread adoption of electric vehicles.

Author: Kester, J., et al. (2021)

Title: *The Role of Consumer Perception in the Adoption of Electric Vehicles*
This paper examines the influence of consumer perceptions on the adoption of electric vehicles (EVs) compared to traditional fuel-based vehicles. The study finds that concerns about battery life, charging infrastructure, and vehicle range are key barriers to EV adoption. The authors suggest that improving consumer education and increasing the availability of charging stations will help overcome these barriers.

Author: Lemoine, F., et al. (2020)

Title: *Policy Measures for Promoting Electric Vehicle Adoption: A Global Comparison*
This paper compares policy measures taken by different countries to promote electric vehicle adoption. It evaluates incentives such as tax breaks, subsidies, and emissions regulations, and examines their effectiveness in accelerating EV uptake. The study concludes that a combination of strong incentives, infrastructure development, and public awareness campaigns are crucial to the success of EV adoption.

RESEARCH METHODOLOGY

AREA OF THE STUDY

This study compares electric and fuel-powered vehicles in Coimbatore based on cost efficiency, environmental impact, and consumer preference. It examines adoption trends, infrastructure, and policies to assess the future prospects of E-vehicles in the city.

SAMPLING TECHNIQUE

A **convenience sampling** method will be used due to the ease of access to respondents and the E-vehicles and fuel vehicles.

SAMPLE SIZE

A sample size of 263 respondents is recommended. This size will provide a balance between manageability and the ability to perform statistically significant analysis, given the diversity in demographic factors like age, income, and education within Coimbatore.

DATA COLLECTION

Data collection methods involve the process of gathering the necessary information once the researcher has determined the type of data required for the study. In this research, data was collected using a structure questionnaire.

RELIABILITY TEST

The study employed Cronbach's Alpha to evaluate the reliability of the questionnaire. A strong internal consistency was demonstrated by the resulting Cronbach's Alpha of 0.884 across the 29 items. This value signifies that the items are closely related and measure the same underlying concept, thus confirming the reliability of the data for subsequent analyses.

ANALYSIS AND INTERPRETATION

CHI SQUARE ANALYSIS

HYPOTHESIS

H0 There is a no signification association between income level and cost and affordability

H1 There is a signification association between income level and cost and affordability

TABLE 4.4.1

Income level	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
10,000 - 19,999	27	47	20	5	8	107
20,000 - 29,999	16	29	8	1	0	54
30,000 - 39,999	11	18	5	0	1	35
40,000 - 49,999	6	14	6	2	1	29
Above 50,000	15	15	4	2	2	38
Total	75	123	43	10	12	263

CHI – SQUARE TEST

Factor	Calculation value	Degree of freedom	Table value
Pearson Chi-Square	13.580 ^a	16	0.630

INTERPRETATION:

The table presents the results of a Pearson Chi-Square test, which is used to assess whether there is a significant association between two categorical variables. The calculated value of the Chi-Square statistic is 13.580, and the degrees of freedom (df) are 16. The table value, which represents the critical value at a given level of significance, is 0.630. Since the calculated Chi-Square value (13.580) is much larger than the table value (0.630), this suggests that there is a statistically significant relationship between the variables being tested, meaning that the differences observed in the data are unlikely to have occurred by chance. However, without a specific significance level (e.g., 0.05 or 0.01), we can tentatively conclude that the association is significant based on the comparison between the calculated and table values.

TABLE 4.4.2

Age	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
18 - 24	42	73	25	6	8	154
25 - 34	25	35	14	3	3	80
35 - 44	7	12	2	0	1	22
45 - 54	1	3	2	1	0	7
Total	75	123	43	10	12	263

CHI – SQUARE TEST

Factor	Calculation value	Degree of freedom	Table value
Pearson Chi-Square	6.199 ^a	12	0.906

INTERPRETATION:

The table presents the results of a Pearson Chi-Square test, which is used to examine the relationship between two categorical variables. The calculated Chi-Square value is 6.199, with 12 degrees of freedom. The table value, which is the critical value for comparison, is 0.906. Since the calculated Chi-Square value (6.199) is much greater than the table value (0.906), it indicates that there is a significant association between the variables being tested. This suggests that the observed differences in the data are unlikely to be due to random chance, and there is a meaningful relationship between the variables.

ANOVA

HYPOTHESIS

H₀ there is a no significant difference between gender and infrastructure and convenience

H₁ there is a significant difference between gender and infrastructure and convenience

TABLE 4.5.1

factors	gender	mean	Std. deviation	F	Sig.
Infrastructure and Convenience [The availability of charging stations for EVs in Coimbatore is sufficient.]	Male	2.23	0.984	0.037	0.847
	Female	2.20	0.927		
	Total	2.22	0.958		
Infrastructure and Convenience [The lack of sufficient charging stations in public places is a challenge for electric vehicle adoption in Coimbatore.]	Male	2.34	1.092	0.308	0.580
	Female	2.27	1.061		
	Total	2.31	1.077		
Infrastructure and Convenience [I am concerned about the long	Male	2.35	1.024	1.862	0.174
	Female	2.19	0.931		

charging times of electric vehicles compared to fueling a petrol/diesel vehicle.]	Total	2.28	0.987		
Infrastructure and Convenience [Fuel-based vehicles are more convenient due to the availability of fueling stations in Coimbatore.]	Male	2.25	1.037	2.062	0.152
	Female	2.07	0.997		
	Total	2.17	1.023		
Infrastructure and Convenience [I think the government should invest more in EV infrastructure (charging stations) in Coimbatore.]	Male	2.41	1.142	4.973	0.027
	Female	2.11	1.055		
	Total	2.28	1.114		

INTERPRETATION:

The table examines gender differences in responses to various statements about EV infrastructure in Coimbatore. For most statements, including the sufficiency of charging stations and challenges in EV adoption, there are no significant differences between males and females, with high significance values (e.g., 0.847, 0.580). However, for the statement on the government's investment in EV infrastructure, males (mean = 2.41) showed significantly higher support compared to females (mean = 2.11), with a significant p-value of 0.027. This indicates that males are more likely to advocate for increased investment in EV infrastructure. Overall, while most views are similar across genders, males generally express stronger support for EV infrastructure development.

FINDINGS

1. The Pearson Chi-Square test result ($\chi^2 = 13.580$, $p = 0.630$) indicates no significant association between income level and agreement levels. Since the p-value is greater than 0.05, we fail to reject the null hypothesis, suggesting that income does not significantly influence responses. The distribution of responses appears fairly consistent across income brackets.

2. The Pearson Chi-Square test result ($\chi^2 = 6.199$, $p = 0.906$) shows no significant association between age group and agreement levels. Since the p-value is greater than 0.05, we fail to reject the null hypothesis, suggesting that age does not significantly influence responses. The response distribution remains relatively consistent across different age groups.

3. The ANOVA results indicate no significant difference between male and female responses for most infrastructure and convenience factors related to EV adoption in Coimbatore ($p > 0.05$). However, a significant difference ($p = 0.027$) is observed for the statement on government investment in EV infrastructure, with males showing a higher mean agreement than females. Overall, gender does not strongly influence perceptions of EV infrastructure challenges, except for government investment.

SUGGESTIONS

1. The income and age do not significantly influence EV adoption perspectives, awareness programs should be designed for a broad audience rather than specific demographic groups and Authorities should prioritize expanding EV charging stations across Coimbatore to improve accessibility and convenience for all users.

2. Given the gender-based difference in support for EV infrastructure investment, policymakers should engage both male and female consumers in discussions and policy decisions. Collaborations between the government and private stakeholders can accelerate the development of EV infrastructure, ensuring sustainable and widespread adoption.

CONCLUSION

The analysis reveals that income and age do not significantly impact EV adoption perspectives, suggesting that awareness campaigns should be inclusive and target a broad audience. Gender differences in perceptions are minimal, except for a higher support among males for government investment in EV infrastructure. To enhance EV adoption, authorities should focus on expanding charging infrastructure and address concerns related to charging convenience. Additionally, engaging both male and female consumers in discussions, alongside fostering public-private collaborations, will drive the sustainable development of EV infrastructure in Coimbatore.

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